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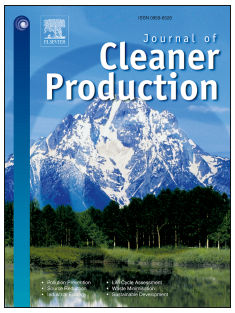

Technological turbulence and greening of team creativity, product innovation, and human resource management: Implications for sustainability

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Title: Technological Turbulence and Greening of Team Creativity, Product Innovation, and Human Resource Management: Implications for Sustainability

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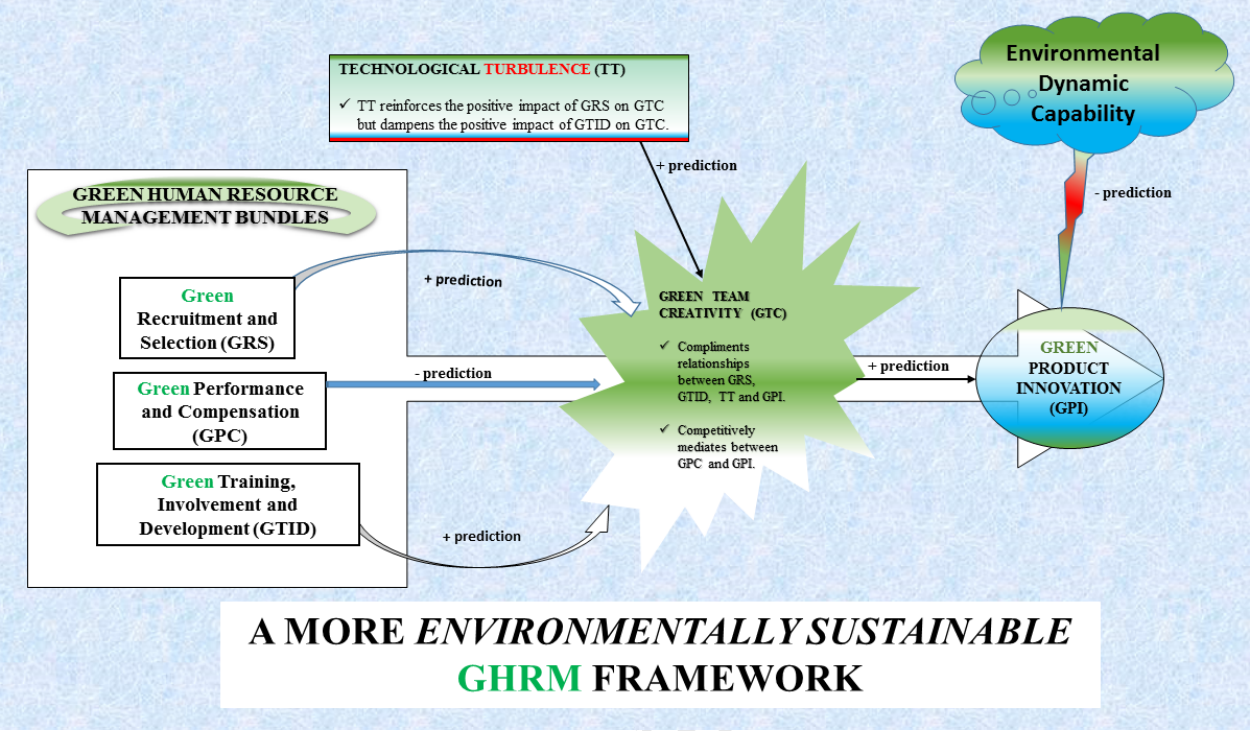

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TECHNOLOGICAL TURBULENCE AND GREENING OF TEAM CREATIVITY, PRODUCT INNOVATION, AND HUMAN RESOURCE MANAGEMENT: IMPLICATIONS FOR SUSTAINABILITY

ABSTRACT

Given the overwhelming increase in technological advancements and global warming concerns, our study attempts to investigate the predictive powers of green human resource management (GHRM) bundles and green team creativity on green product innovation. Additionally, we examine the roles of technological turbulence and environmental dynamic capability. We have administered a cross-sectional (time lag) survey design with 229 respondents from 31 manufacturing organisations and employed the partial least square path modelling (SmartPLS3) for data analysis. Results indicate that *technological turbulence*, *green recruitment and selection* and *green training, involvement and development* are positive predictors of *green team creativity*. *Green performance and compensation* negatively predict *green team creativity*. While *green team creativity* positively predicts *green product innovation*, *environmental dynamic capability* negatively predicts *green product innovation*. *Technological turbulence* reinforces the positive impact of *green recruitment and selection* on *green team creativity* and dampens the positive impact of *green training, involvement and development* on *green team creativity*. Furthermore, *green team creativity* is a complementary and competitive mediator. By simultaneously investigating the predictive powers of *technological turbulence*, *green team creativity* and *environmental dynamic capability* in our study, we offer novel insights that extend traditional HRM conceptualisations to reflect a more environmentally sustainable GHRM framework. Policy implications and future directions are also discussed.

Keywords – Green human resource management bundles; Green team creativity; Green product innovation; Technological turbulence; Environmental dynamic capability.

TECHNOLOGICAL TURBULENCE AND GREENING OF TEAM CREATIVITY, PRODUCT INNOVATION, AND HUMAN RESOURCE MANAGEMENT: IMPLICATIONS FOR SUSTAINABILITY

1. Introduction

Green product innovation (GPI) and the increase in *technological turbulence* (TT) in the last thirty years has led to calls for manufacturing organizations to conduct themselves in more socially responsible ways (Kaivo-oja and Lauraeus, 2018; Song et al., 2018). On a similar note, due to increased global competitiveness, the impact of manufacturing organizations has provoked widespread demands for more sustainable practices that meet environmental needs, as embellished in the debates of extant research (Zaid et al., 2018). As a result, industry leaders and other stakeholders have expressed their concerns about the impact of global warming, which is also a consequence of TT and the pursuit of increased competitive advantage (Chen et al., 2015). Schumpeter (1934) postulated that *TT* is the constant changes in technology in an industry that renders existing technologies obsolete. Although, Schumpeter (1934) further conjectured that TT is an important catalyst for industrial development, extant studies lament that environmental concerns garner inadequate attention, partly due to insufficient consideration of the impact of *environmental dynamic capability* (EDC) by organisational leaders (Huang et al., 2014; Jansen et al., 2009).

EDC deals with how the environment provokes variations in technologies, disparities in customer inclinations, and oscillations in product demand or supply of materials (Jansen et al., 2006). Though extant literature may have previously described the impact GPI has on the

environment (Huang et al., 2014), there is a lack of empirical research that has examined how EDC predicts GPI. Notwithstanding, EDC can escalate or inhibit the likelihood of meaningful outcomes in GPI. EDC is also argued to aggravate increasing demands which creates organizational circumstances that are typified by tension, apprehension and risk (Waldman et al., 2001). Therefore, for organisations to successfully implement GPI, the impact of EDC ought to be taken into consideration.

Similarly, rapid changes in technology and the resulting negative impacts have provided the impetus for organisations around the world to go "green" (Yong et al., 2019a). Therefore, to successfully implement organisational "green-wide" initiatives, studies debate whether the efficient and effective deployment of human capital development by adequate *human resources management* (HRM) systems would help (Ahmad, 2015; Yong et al., 2019b). Note that although *HRM* mirrors the strategic approach adopted by the employer to attract and develop human capital in order to maximize productivity and gain competitive advantage in the global marketplace (Jabbour, 2013), Jabbour (2011) and Renwick et al. (2013) advocated the idea that it is important for HRM to also go "green", an idea called *green human resource management* (GHRM). *GHRM* is, therefore, 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 (Roscoe et al., 2019).

It is against this backdrop that manufacturing organizations in developing economies like Malaysia (the one we are studying) and others have begun to change their activities by implementing *green product innovations* (GPI) (Chams and Blandon, 2019; Yong et al., 2019a). *GPI* is described as the implementation and advancement of innovative, remodelled, or

significantly enhanced environmentally sustainable goods (Chan et al., 2016; Yi-Chun et al., 2016). Similarly, several Malaysian manufacturing organizations strive to continuously improve their deployment of GHRM initiatives in ways that align with the tenets of the stakeholder's theory (Yong et al., 2019a). GHRM in Malaysia has identified human capital as an important arbitrator in the relationship between HR practices and performance (Chen et al., 2015). Moreover, it is important that manufacturing organisations in Malaysia implement GHRM initiatives in their recruitment and selection tools, to attract prospective employees who are conversant with GHRM requirements (Nejati et al., 2017). However, job descriptions for entry-level employees of various manufacturing organizations in Malaysia lack green criteria and green key performance indicators (Yusoff et al., 2018). In other words, the recruitment and selection systems employed in several Malaysian manufacturing organizations don't have the green-centred indices necessary to attract prospective employees who are attracted by environmental sustainability practices (Yusoff et al., 2018).

Likewise, the skills training and creativity development of green values for teams necessary to produce green centred creative ideas and behaviours in the workplace are absent in several Malaysian manufacturing organizations (Yusliza et al., 2017). Besides initiatives needed to create awareness in energy efficiency, waste management and recycling are absent from the induction processes of various Malaysian manufacturing organizations, as GHRM values are sparsely sought after in prospective employees during recruitment and selection (Yusliza et al., 2017). This has further led to an inadequate articulation of green initiatives which has consequently been argued to negatively influence green creativity and GPI in various Malaysian manufacturing organizations (Nejati et al., 2017). It is, therefore, no surprise that performance appraisal used in several manufacturing organisations in Malaysia do not have green

performance as a key performance indicator (Chen et al., 2015). Likewise, established pay and rewards systems have not been designed to encourage green-centred innovations and this impedes a conducive environment for fostering *green team creativity* (GTC) and GPI (Yusoff et al., 2018).

As a further attempt to mitigate such concerns, it is also necessary that organizations indoctrinate their employees on the significance of GTC and GPI to engender values promoting environmental sustainability (Ferreira et al., 2018). *GTC* is defined as the conception, improvement, and advancement of environmentally sustainable and innovative ideas among teams in an organization (Chen et al., 2015). GTC could aid organisations in generating creative ideas that build distinctively upon a broader spectrum of philosophies and further craft new elucidations that promote GPI (Chan et al., 2016). In other words, organizations ought to support current, established philosophies related to GTC and GPI as inferred in the dogmas of the Kyoto Protocol and United Nations Global Compact (UNGC) network (Chams and Blandon, 2019; Shyu, 2014). Thus, the practice of going "green" is increasingly becoming more relevant as it helps organizations drive towards more sustainable developments in society (Awan et al., 2019).

Extant research also espouses the need for leaders to not overlook the several roles of GHRM bundles in driving organizations towards more environmentally sustainable outcomes (Kay et al., 2018). Consistent with prior literature (Renwick et al., 2013; Zaid et al., 2018), GHRM practices can be examined via its sets of bundles known as *green recruitment and selection* (GRS), *green performance and compensation* (GPC), and *green training, involvement and development* (GTID). *GRS* is the identifying, evaluating and hiring of individuals with task expertise, motivation and creativity skills which are congruent with environmental management tenets and development (Jabbour and Jabbour, 2016; Jia et al., 2018). Studies argue that *GPC*

reflects established processes and policies that prompt teams to enhance their professional skills in the pursuit of addressing related environmental concerns of an organisation (Pham et al., 2019; Zaid et al., 2018). Similarly, *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 (Ahmad, 2015; Zoogah, 2011).

Prior evidence relates that GHRM bundles ought to constantly allow for re-evaluation of teams' creativity to enable teams to provoke green-centred creative ideas which foster innovation of green products (Nejati et al., 2017). This is consistent with studies (Raut et al., 2019; Yong et al., 2019) advocating that organizational leaders ought to ensure that current and potential team members exhibit creative behaviours that can foster environmental sustainability. Therefore, several initiatives of GHRM bundles are thought to have positive impacts on GTC and GPI (Nejati et al., 2017; Kazanjian and Drazin, 2012). Consequently, employees working in a team can be motivated to integrate, share, articulate and constantly execute GPI (Kay et al., 2018).

Several studies that espoused GHRM's impact on innovation, have also overlooked the plausible mediating role of a team-level analysis of creativity (Hall and Rosson, 2006; Kay et al., 2018). Some of these studies (Nejati et al., 2017; Raut et al., 2019) might have implicitly considered the concepts of GHRM and GPI, but sparsely investigated GTC. While a number of empirical works have otherwise focused on existing correlations between GHRM bundles and a firm's performance (Kim et al., 2019; Olaisen and Revang, 2017), others postulate that firms that engage in GHRM are most likely to enjoy better brands, higher staff retention and experience increased revenues in the long run (Olaisen and Revang, 2017). Moreover, GHRM bundles take into account the social and environmental impacts of the organisation by ensuring the right

talents are recruited and cultivated towards the benefit of not just the organisational shareholders but also all stakeholders (Zaid et al., 2018). Equally, by positively contributing towards environmental sustainability for primary and secondary stakeholders such as employees, shareholders, suppliers, customers, the community and government (Clarkson, 1995), GHRM bundles are therefore, congruent with stakeholder theory which addresses how stakeholders and organisations interact with each other to ensure satisfaction of stakeholders' needs and expectations (Amran et al., 2016). Although this theory espouses the role of actors in an organisation's environment, it overlooks how organisational GHRM bundles really act to contribute towards sustainable environmental outcomes that benefit all stakeholders alike (Amran et al., 2013). This is supported by the lack of sufficient empirical evidence that predicts the association of GHRM bundles, GTC and GPI, as a strategy towards subsequently contributing to the tenets of stakeholder theory. It is thus unclear what causal-predictive and practical inferences could be deduced from extant results due to a lack of coherent evidence matched against today's rise in constant change and technological uncertainty.

Although researchers have debated that there exists a positive correlation between GHRM and creativity, the factors underpinning GPI lack sufficient attention in terms of how GPI is impacted by both GHRM and GTC (Song et al., 2018). Likewise, the literature examining the positive link between creativity and innovation (Kim et al., 2019; Chams and Blandon, 2019) sheds insufficient insight on how green team creativity influences green product innovation under the influence of a technologically turbulent and dynamic business environment. Furthermore, other studies (Chen et al., 2018; Song et al., 2018) have overlooked the probable distinct impacts of technological turbulence and environmental dynamic capability (EDC) on green team creativity and green product innovation. Technological turbulence poses challenges

to incumbent business despite its capability of provoking ground-breaking prospects (Wu et al., 2017). Likewise, given the constant rise of technological turbulence and the fight to mitigate global warming threats, it is yet unclear from the literature (Chavez et al., 2015; Yong et al., 2019b) how technological turbulence influences the impact of distinct GHRM practices on GTC (Chen et al., 2018). Equally, several extant studies (Chen et al. 2018; Chavez et al., 2015) have overlooked the predictive role of EDC on GPI and it is these clear gaps in prior literature that this paper seeks to fill.

Table 1. Collation of definition of basic terminologies

Construct	Definition	Construct	Definition
Green human resource management (GHRM)	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 (Roscoe et al., 2019).	Environmental Dynamic Capability (EDC)	Deals with how the environment provokes variations in technologies, disparities in customer inclinations, and oscillations in product demand or supply of materials (Jansen et al., 2006).
Green recruitment and selection (GRS)	The identifying, evaluating and hiring of individuals with task expertise, motivation and creativity skills which are congruent with environmental management tenets and development (Jabbour and Jabbour, 2016; Jia et al., 2018).	Technological turbulence (TT)	The constant changes in technology in an industry that renders existing technologies obsolete (Schumpeter, 1934).
Green performance and compensation (GPC)	Established control, evaluation or measurement processes and policies that prompt teams to enhance their professional skills in the pursuit of addressing related environmental concerns of an organisation (Pham et al., 2019; Zaid et al., 2018).	Green product innovation (GPI)	The implementation and advancement of innovative, remodelled, or significantly enhanced environmentally sustainable goods (Chan et al., 2016; Yi-Chun et al., 2016).
Green training, involvement and development (GTID)	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	Green team creativity (GTC)	The conception, improvement, and advancement of environmentally sustainable and innovative ideas among teams in an organization (Chen et al., 2015).

(Ahmad, 2015; Zoogah, 2011).

2. Literature review and hypothesis development

2.1 Green Recruitment and Selection (GRS) and Green Team Creativity (GTC)

Faced with today's technological turbulence and dynamic environment, organisations are beginning to intensify their GRS pursuit in order to continuously obtain, exploit and deploy cognitive resources exemplified by GTC (Ahmad, 2015). As this approach not only helps to strengthen an organisation's image as a green centred entity, it also increases the likelihood of attracting high-level potential team members who consequently view such organisations as 'green employers of choice' (Tam, 2017). Teixeira et al. (2012) and Siyambalapitiya et al. (2018) emphasized that in the quest to recruit green centred employees, organisations' environmental policies enshrined within green recruitment strategies could be the key element to attract the most suitable talents. Studies thus relate that GRS is an effective way to initially catalyse the creativity of employees, who, before being creative team members, were originally concerned about environmental sustainability (Masri and Jaaron, 2017). However, Jia et al. (2018) assert that, to eventually initiate GTC, the clarification of aspects related to environmental regulations that identify with job specifications are required.

Consistent with the work of extant research (Masri and Jaaron, 2017), Guerci et al. (2016) demonstrated that recruitment and selection intents related to environmental sustainability does play an important role in attracting potential like-minded employees and Jia et al. (2018) further espouse that such employees could be subsequently grafted into the workforce as green centred team members capable of engendering green creativity. By consistently including green goals in leaders' job descriptions and having green job descriptions for teams, organisations may be able to realign creative ideas of teams towards more environmentally sustainable outcomes,

thereby boosting the green creativity of teams (Jiang et al., 2012). Nevertheless, much is needed to be done as extant literature also lacks sufficient empirical evidence for the association of GRS and GTC (Jia et al., 2018; Zaid et al., 2018). This provides us with an additional opportunity to contribute to the tenets of the stakeholder's theory. We, therefore, postulate that GRS is a positive predictor of GTC.

H1a: GRS positively predicts GTC

2.2 Green Performance and Compensation (GPC) and Green Team Creativity (GTC)

Integrating environmental factors, including minimum standards and compensation criteria for environmentally sustainable activities in performance-related pay is reported as a good indicator of management's success in the drive for environmental sustainability (Renwick et al., 2016). Although GPC is another important GHRM bundle, empirical evidence of its impact on team creativity is scarce (Jabbour and Jabbour, 2016). Thus, if environmental criteria are integrated into performance appraisal and compensation systems, employees can deal with ecological issues satisfactorily to improve their environmental performance (Siyambalapitiya et al., 2018). Masri and Jaaron (2017) debate that HRM practices ought to ensure environmental performance and compensation should be integrated into environmental management objectives, achievements evaluations, responsibilities, green behaviours monitoring by employing ratings of green work (in terms of green creativity expectations) as prime indicators of job performance. In this context, feedback on green performance and compensation standards is of importance, and Govindarajulu and Daily (2004) contended that by encouraging feedback, team members can enhance their cognitive capabilities, consequently increasing activities associated to green creativity. Congruent with Wehrmeyer (2017), the study of Ramus (2001) found that as a measure of green compensation, rewards that are recognition-based such as plaques or praise

letters had a strong positive impact on commitment towards environmental sustainability. Masri and Jaaron (2017) further emphasised that this could engender GTC as team members become more committed to sharing green associated creative ideas relating to set environmental sustainability tasks.

In an attempt to better understand GPC's underpinnings, prior research contends for the adoption of corporate-wide standards of environmental performance and compensations to further determine how teams exert sustainable practices like waste management and waste reductions (Marcus and Fremeth, 2009; Renwick et al., 2013). Ahmad (2015) advocates that GPC can have a positive impact on the knowledge, ability and skills of employees and further aid organisations' green objectives. By leveraging core features of GPC like auditing, appraising, offering constructive feedback, rewarding, and compensating team environmental behaviours that meet or exceed both organisational and stakeholders' expectations, leaders can motivate and inspire more team creativity (Renwick et al., 2013). Teams become more prompted to commit more creative efforts towards enhancing green initiatives (Marcus and Fremeth, 2009). Likewise, use of extrinsic motivational schemes like tailored packages for rewarding acquisition of green skills; monetary and non-monetary (leave, sabbaticals or gifts) and others, have been advocated to positively influence team creativity (Ahmad, 2015; Renwick et al., 2013). GPC consequently encourages teamwork, diversity, collaboration, and also environmental stewardship (Liebowitz, 2010). We thus theorise that GPC positively predicts GTC.

H1b: GPC positively predicts GTC

2.3 Green Training, Involvement and Development (GTID) and Green Team Creativity (GTC)

Teixeira et al. (2012) and Jabbour (2013) advocated that, in the quest for environmental sustainability, the tenets of the GTID are relevant for educating and developing team members on the value of environmental management, energy conservation, waste reduction and the

diffusing of environmental pollution. Arulrajah et al. (2015) supported by emphasising on the value of team members' green education and training, as it has the potential of provoking knowledge and relevant capabilities for fostering environmental sustainability practices. Equally, the studies of Masri and Jaaron (2017) and Jabbour (2011) reflect that GTID has the most significant positive association with environmental practices. This is further supported by Daily's et al. (2012) study which found that environmental training of team members is significantly effective. Thus, Jia et al (2018) argue that GTID initiatives should consist of environmentally sustainable practices such as conferences and workshops that spur green creativity among team members. Moreover, the works of Liboni et al. (2019) and Hamdoun et al. (2018) further indicate that initiatives associated with GTID enables team members to perform their work in a way that minimises significant negative impacts on the environment, and well-designed training enhances value creation and green centred innovations.

The provision of GTID environmental awareness training ensures that staff involvement and empowerment in the use of emerging technologies translates traditional work processes from piles of paperwork into operations in digital workspaces and is supportive of green grounded strategies (Renwick et al., 2013). Employing an efficient system of GTID can thus be argued to be an effective tool for fostering GTC in organisations (Jia et al., 2018). Likewise, exhibiting green driven creative behaviours requires the continuous acquisition of defined expertise and skills that can enhance team knowledge and skills (Brio et al., 2007). Hence, GTID can promote divergent thinking and create opportunities that foster learning and task domain expertise enhancement (Renwick et al., 2016). Although, researchers (Jiang et al., 2012; Brio et al., 2007) have debated the positive impact of training, like involvement and development of team creativity, little is known as to how GTID predicts GTC when examined from prior empirical

contentions on GHRM (Renwick et al., 2013). Given this background and these opportunities, we theorize the following positive effects on green team creativity. The following conjecture is consequently highlighted.

H1c: GTID positively predicts GTC

2.4 Green Team Creativity (GTC) and Green Product Innovation (GPI)

De Medeiros et al. (2014) and Masri and Jaaron (2017) accentuated that green management practices are more likely to initiate GPI, as they may often involve team members' exchange of green centred creative ideas which are likely to engender GPI. This is supported by the debate of Jabbour et al. (2015) which espoused that GPI is influenced by human aspects. The GTC underpinnings have been stressed to be positively associated to environmental sustainable innovations (Jia et al., 2018), and Fields (2017) equally emphasized that such association is relevant for fostering sustainable management practices which are geared towards environmental sustainability solutions. Song and Yu (2017) compliments this notion by contending that when organisations implement green creativity, it is quite likely to provoke and subsequently enhance green innovation. Moreover, prior research that has examined the relationship between creativity and innovation relate similar notions of their positive associations (Gilson and Litchfield, 2017; Shalley and Gilson, 2004). The work of Song and Yu (2017) also provides strong support for the positive relationship between the greening of creativity and innovation. However, this finding reflects a much general view of green creativity and green innovation, thus lacking the specificity that could have otherwise provided richer insights which extends beyond contemporary individual creativity levels. Although much has been done over the years to produce thought-provoking findings, it is yet unclear how a team's exhibition of green-oriented creative behaviours might engender green product innovation (Jiang et al., 2012). Further, the

literature on GTC is sparse (Mittal and Dhar, 2016) and its plausible impact on GPI could be argued to vary by context (Asaah et al., 2019; Lau and Ngo, 2004), given its underpinning green philosophies (Kawai et al., 2018). We thus attempt to extend prior understanding on the subject by positing that GTC positively predicts GPI.

H2: GTC positively predicts GPI.

2.5 Technological Turbulence (TT) and on Green Team Creativity (GTC)

Given the constant rise in technological advancements and its probable influence on the business environment, exhibiting creative behaviours that may gravitate towards meaningful GPI could be very challenging for a team (Zhou et al., 2018). However, prior debate espouses that TT has a positive association with creativity (Im et al., 2013). This is also congruent to the claim of Wu et al. (2017), which supports that TT tends to provoke teams to constantly engage in and, therefore, exhibit increased creativity. Hall and Rosson (2006) emphasised that constant rise in technological advancements renders incumbent knowledge obsolete but thereby, create room for divergent or alternative options. This could drive teams to further explore alternative avenues, cross-fertilize fresh ideologies and consequently produce thought-provoking concepts to further undergird green creativity (Fields, 2017). According to Zhou et al. (2018), TT can cause team members to challenge the current status quo of existing technological frontiers. This process gives birth to several choices, by which green creativity can be engendered and increased (Mittal and Dhar, 2016). Equally, recent research espouses that TT drives a need for increased competition, even in terms of brand image for green centred organisations (Tam, 2017). It is under such conditions of increasing TT that GTC becomes even more relevant for green centred organisations (Kamolsook et al., 2019). Distinct organisations thus become more compelled to push their teams' creativity towards exploring and exploiting novel insights relevant for

advancing environmental sustainability tenets (Yusliza et al., 2017). Whilst the literature on TT and green creativity has recently begun to receive increased attention, much is yet to be done to empirically establish, and consequently deepen insights into how TT predicts green creativity from a team level analysis. Therefore, we theorize the following.

H3: TT positively predicts GTC.

2.6 Environmental Dynamic Capability (EDC) and Green Product Innovation (GPI)

In today's intensely competitive environment, green centred organisations are constantly taking more active steps to search and interpret more information that provokes a better understanding of the environment they face (Reyes-Santiago et al., 2019). Chan et al. (2016) espouse that the environment has the dynamic capability of influencing how organisations respond towards producing innovations which identify with influences and demands of actors such as competitors, customers, market and technological demands within distinct business settings. While Ar (2012) identified a significant association between environmental dynamic capability and firm's product innovation, Frank et al. (2017) assert that in most cases, firms adhere to environmental changes by innovating products that suit their consumer's preference. This is congruent to Costantini and Mazzanti's (2012) study which debated that EDC reflects the change of growth potential in the green organisation's industry, the frequency of changes in the organisation's operative routines, the rate of innovations in regard to products and processes, as well as the development of R&D activities. The impact of EDC on innovation in general have been widely examined (Huang et al., 2014; Jiao et al., 2011). However, due to the varying contextual influences of EDC on product innovation, extant findings have so far remained inconclusive (Reyes-Santiago et al., 2019).

Moreover, Chan et al. (2016) posit that since EDC mirrors an unstable environment, current GPIs may easily become replaced or obsolete too, due to rapid changes in technology, suppliers, customer or market demands. EDC thus, consequently increases organisations' operations and new green product development costs and complexity as organisations become constantly compelled to re-invent new green products (Fontana, 2019). Accordingly, green centred organisations may become less likely to engage in the continuous innovation or implementation of green products due to increased rate of uncertainty within the business environment (Jabbour et al., 2015). It is also important to note that the act of innovating is often time-bound and a defined GPI may become less fitting or relevant for constantly evolving business environments at the time when GPIs become market-ready (Jansen et al., 2009). It is also probable that by the time organisations successfully redirect their resources towards re-innovating green products, their final GPI outputs could eventually be less relevant to stakeholders having increasing interests for other disruptive technologies (Kamolsook et al., 2019). Studies thus emphasize the need for leaders to possess and demonstrate strong environmental analytic skills to foster innovation of green products that meaningfully identify with specific business environments (Huang et al., 2014). Consequently, we theorize the following.

H4: EDC negatively predicts GPI

2.4 The Moderating Effects of Technological Turbulence (TT)

TT is defined as the degree of change of technology in an industry (Chen et al., 2018). Despite the varying positive efforts from GHRM bundles tailored towards GTC enhancement, some studies (Kim et al., 2019; Tang et al., 2015) argue that anticipated "green" outcomes are often met with intense uncertainty under conditions of TT. Wu et al. (2017) advocate that fast-

changing technological environments are known for their rapid rate of technological obsolescence. Thus, it is quite likely that TT tends to either provoke increased team creativity or dampen a team's motivation to continue to exhibit creative behaviours (Chen et al., 2018). Moreover, Chen et al. (2018) emphasize that TT positively influences team creativity by creating opportunities for new knowledge acquisition. Equally, TT can also force constant changes in the way GHRM bundles are implemented to drive GTC, as a high or low influence of TT on implementation of GHRM bundles could have varying degrees of impacts on GTC (Chen et al., 2018; Tang et al., 2015). Extant research has thus espoused the idea that despite the pursuit for competitive advantage via the leveraging of team creativity, an organisation's GHRM bundles ought to frequently be given apt attention (Ahmad, 2015; Jiang et al., 2012). Although there is yet a lack of literature on TT, GHRM and GTC, several studies advocate that under conditions of TT, organisational leaders ought to drive internal resources to adapt to changing technology demands (Jansen et al., 2009). Nevertheless, recent findings fail to empirically demonstrate how TT influences the capabilities of GHRM bundles to foster GTC (Jiang et al., 2012; Tang et al., 2015).

Moreover, in light of the fourth industrial revolution, Wu et al. (2017) contend that TT is rapidly revolutionizing the operations of organizations. This thus, creates more opportunities for green teams to explore varying alternatives for demonstrating increased green creativity (Mittal and Dhar, 2016). GHRM bundles such as GRS could thereby benefit from TT by utilizing technological advancements to foster identification, selection, assessment and recruitment of potential green centred team members whose creativity could help engender environmental sustainability (Jabbour et al., 2013). Hence, green centred organisations need to align their GHRM tenets in ways that constantly identify with new technological changes (Renwick et al.,

2016). Equally, TT which is argued to be a key element of environmental change could present opportunities for organisations to adapt to, or adopt new technologies that can further engender their GPC objectives (Zhou et al., 2018). Consequently, the adoption of newer and better performing technologies could aid to foster the implementation processes of corporate-wide standards of environmental performance and compensations (Renwick et al., 2016). Green expectations from team members can thus, be better regulated and guided in ways that engender increased green creativity via which organisations may positively drive environmental sustainability initiatives (Mittal and Dhar, 2016). Team members may also be more motivated to exhibit increased creative behaviours when GPC practices such as auditing, appraising, offering constructive feedback, rewarding, and compensation of team environmental behaviours are done with efficient technological advancements (Roscoe et al., 2019). This way, time delays, hierarchical structure barriers, increased team stress due to excessive control and others, could be curbed to allow for efficient green compensation schemes (Thompson et al., 2012). Studies (Liboni et al., 2019; Zhu et al., 2016) argue that the use of newer technologies can be a tool to foster team members' satisfaction, commitment and motivation in the workplace.

Additionally, the works of Ball et al. (2019) and Siyambalapitiya et al. (2018) suggests a significant relationship between environmental technology and employees' training and development. Thus, ensuring efficient implementation of GTID processes could require organisations to also adapt GTID initiatives to closely identify with current advancements in technology which are relevant for fostering green creativity initiatives in the workplace (Jia et al., 2018). Similarly, effective adoption and integration of newer technologies (which are consequences of TT) into GTID processes could help reinforce team members' capabilities deployed to achieve set environmental sustainability objectives (De Medeiros et al., 2014).

Consequently, being well supported by required and adequate technologies, generation and further execution of green creativity initiatives could be a lot faster and less challenging for green teams. Congruent with Jabbour (2013) and Yong et al. (2019), GTID tenets strengthens teams' cognitive development of environmental awareness and knowledge and builds up their motivation and commitment towards increased environmental sustainability. Thus, team members would be more willing to exhibit increased creative behaviours as green initiatives are aligned to constantly identify with rising expectations of TT (Jia et al., 2018). Therefore, we postulate the following.

H5a: TT strengthens the positive relationship between GRS and GTC.

H5b: TT strengthens the positive relationship between GPC and GTC.

H5c: TT strengthens the positive relationship between GTID and GTC.

2.5 The Mediating Role of GTC in the Relationship between Technological Turbulence (TT) and Green Product Innovation (GPI).

GTC has been argued in several scholarly works to be a major human capital resource that drives organisational competitive edge (Cai et al., 2019). Extant research also supports that given today's dynamic environment and increasing TT, organisational leaders need to maintain a constantly growing pool of creative workers in order to foster GPI (Chan et al., 2016). Continuous motivation, resource allocation, positive support and autonomy to implement creative behaviours, could be useful if employed by teams to mitigate the influence of TT on GPI (Herath et al., 2017). Given the positive association between TT and innovation as espoused by extant studies (Chen et al., 2015; Chen et al., 2018), and the positive nexus between creativity and innovation in prior research (Gilson and Litchfield, 2017), it is likely that GTC would be a complimentary mediator of the relationship between TT and GPI. This is also because, the

presence of GTC could foster the adoption and or adaptation of technological advancements which are incorporated into an organisation (Chen et al., 2018). Newer and better technologies employed in organisations to drive the implementation of GPI may require the expertise of creative team members to comprehend and demonstrate expert knowledge of set technologies (Tang et al., 2014). Equally, as TT continues to influence organisational processes, creative teams can more quickly develop creative ideas which would help produce several alternatives by which GPI may be consequently engendered (Hamdoun et al., 2018). Moreover, in highly competitive business settings, green centred organisations would need the capabilities of GTC to create meaningful GPIs and consequently maintain market leadership of defined green products (Chan et al., 2016). Congruent with the stakeholder theory, whilst such organisations thus, contend to maintain competitive advantage, they consequently end up demonstrating green practices that helps undergird environmental sustainability (Amran et al., 2016).

H6a: GTC mediates the relationship between TT and GPI

2.6 The Mediating Role of Green Team Creativity (GTC) in the Relationship between Green Recruitment and Selection (GRS) and Green Product Innovation (GPI).

Bearing in mind the probable roles of GHRM bundles in fostering GPI via GTC is also important. In this wise, the implementation of all GHRM bundles ought to be done with constant re-evaluation of the GRS, GPC and GTID practices (Zoogah, 2011). GRS can play an essential role in driving GTC initiatives towards the innovation of meaningful green products. GRS has been debated to foster the increase of environmental performance objectives through the identification, selection, assessment and recruitment of green centred potential team members (Jackson et al., 2011). GRS helps to actively promote organisation's environmental credentials to recruit potential creative team members who may contribute towards the engenderment of GPI

initiatives (Renwick et al., 2016). Insights from Yusliza et al. (2017) relate that it is important for organisations to go beyond just the contemporary GRS strategies and towards developing strategies for *attracting* potential creative team members who are also green centred. This approach is useful for helping organisations create a wider pool of green human capital resources whose creativity could be employed to advance environmental sustainability via innovation of green products (Tseng et al., 2013).

H6b: GTC mediates the relationship between GRS and GPI.

2.7 The Mediating Role of Green Team Creativity (GTC) in the Relationship between Green Performance and Compensation (GPC) and Green Product Innovation (GPI).

GPC, on the other hand, is another important GHRM bundle which may also be employed to drive GTC initiatives towards the fruition of anticipated environmental sustainability-related objectives (Jabbour, 2011). Given the idea generation, collection, and exchange processes embedded within GTC initiatives (Gilson and Litchfield, 2017), there is a dire need for green creative ideas to be controlled to avoid fixations on too many ideologies and the focus on expected targets strongly maintained (Ogbeibu et al. 2018b). Likewise, green performance monitoring systems is debated to aid evaluation processes and to ensure green expectations are met accordingly and aligned to expected best practices as stipulated in green performance assessment programs (Renwick et al., 2016). Performance assessment programs are necessary to guarantee effective management of environmental sustainability activities over time since embedded measures allow for continuous evaluation of team members' current and expected green performance (Jabbour et al., 2015). Additionally, Jabbour et al (2013) emphasised on the importance of green compensation as a necessary driver for fostering environmental performance. Creative teams who are consistently compensated for being part of

or accomplishing green-related initiatives, tend to be more motivated and committed to exhibiting increased creative behaviours that could upsurge the production of green innovations (Yong et al., 2019).

H6c: GTC mediates the relationship between GPC and GPI.

2.8 The Mediating Role of Green Team Creativity (GTC) in the Relationship between Green Training, Involvement and Development (GTID) and Green Product Innovation (GPI).

Similarly, Jia et al. (2018) advocate that GTID tenets mirror a positive association with the motivation of team members to exert increased creativity which according to Chan et al. (2016) could provoke meaningful GPI. The process of training, involving and the extra efforts of organisational commitments tailored towards teams' development are likely to inspire team members to become more involved in environmentally sustainable initiatives (Daily et al., 2012). Jabbour et al. (2013) espouse that training teams to become more environmentally aware and involved in green practices and grafting team members into decision-making processes may serve as a motivational driver for the greening of product innovations. Studies also clarify this notion as being important for cultivating and inspiring creativity among teams of organisations that have GPI expectations (Chan et al., 2016; Chen et al., 2018). This is also because creative actions have been shown by prior literature to have the capacity of expediting organisational objectives towards fruition (Bai et al., 2016). Although, relative works of extant research have yielded several meaningful findings, much is yet to be done to advance prior HRM conceptualisations of creativity and innovation towards an emerging undergirding that closely addresses stakeholders' environmental concerns of an organisation's GHRM capabilities (Jiang et al., 2012; Yong et al., 2019b). Consequently, by investigating how GTC transfers and catalyses objectives of GHRM bundles to engender a meaningful GPI, we attempt to advance

prior knowledge and advocate meaningful solutions for fostering environmental sustainability. We, therefore, theorise the following;

H6d: GTC mediates the relationship between GTID and GPI.

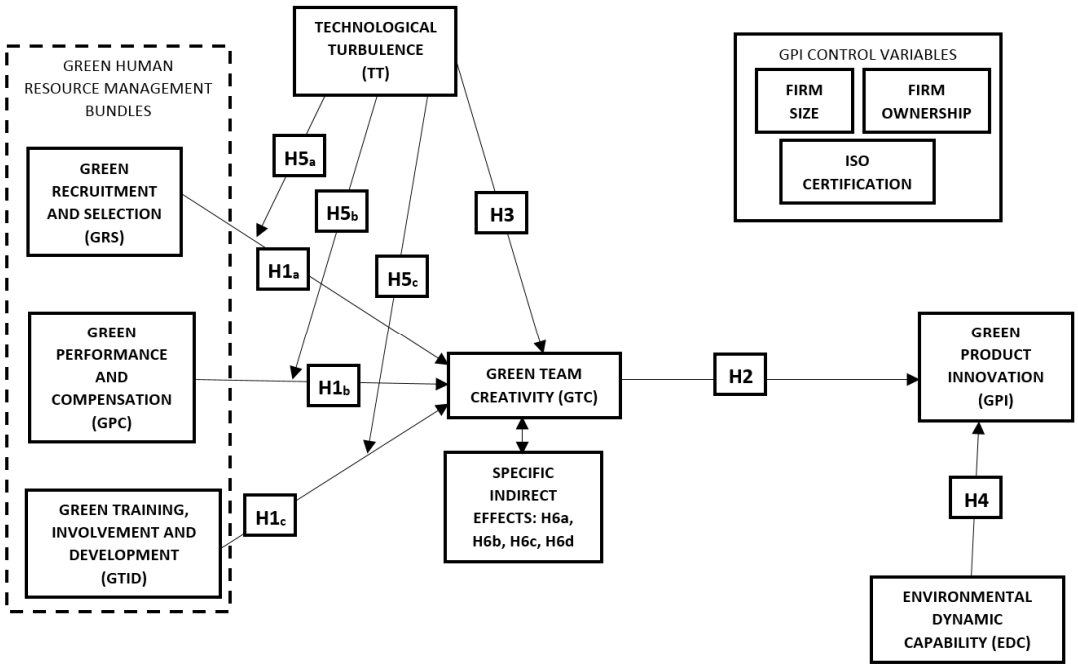

Figure 1: Conceptual framework

3. Research method

3.1 Sample size and data collection procedure

Congruent with Jiang et al. (2012) and Ogbeibu et al. (2018a), leaders and subordinates of teams from HRM departments and research and development (R&D) of 31 manufacturing organisations characterized this study's target population. The Malaysian Stock Exchange has been examined to identify the manufacturing organisations, and this approach is congruent with prior literature (Goh et al., 2014). The locations of the manufacturing organisations are Klang Valley and Penang, which are established major industrial trading hubs in Malaysia (Abdullah et al., 2015). The Krejcie and Morgan (1970) determinant of sample size helped guide this study's sample size measurement, and for achieving a stratified proportionate sampling of respondents.

Out of a total of 623 copies of distributed questionnaires, we received only 229 completed copies that were found useful for subsequent analysis. This resulted in a 36.7% response rate that far exceeds that of similar prior research (Abdullah et al., 2015). Ages of respondents ranged from 24 to 58 years. A total of 44% of male respondents indicate that neither gender has been overrepresented. Equally, 39% had undergraduate degrees, 33.8% were master's degree holders, 20.6% had a diploma/equivalent and 6.6% had a Ph.D.

Three experts and three researchers evaluated our questionnaire items before distribution. Data collection was performed by nine recruited and trained research assistants (RAs). Consistent with extant research, a pilot study was conducted with 50 respondents (Ogbeibu et al., 2018a). SPSS software (v22) was used for data analysis and several poorly loaded items were consequently dropped (Hair et al., 2010). However, a minimum of three indicators were retained for all constructs to maintain reliability (Hair et al., 2010). Actual data collection was executed by RAs who contacted HR managers. Participants were also instructed to ensure completed questionnaires were sealed and returned to respective HR managers for further collection and collation purposes by the RAs. Consistent with MacKinnon et al. (2012) and Stone-Romero and Rosopa (2008) on prediction and mediation models, questionnaires for GTC were distributed seven weeks after the distribution of questionnaires for GHRM bundles, and TT. Equally, questionnaires for GPI and EDC were distributed nine weeks after the distribution of GTC questionnaires. This allowed for increased relative validity of inferences on the predictive criterion of the exogenous constructs and also dampened the likelihood of common method bias (CMB) posing a severe threat in our study (Podsakoff et al., 2012; Stone-Romero and Rosopa, 2008). Likewise, participants' anonymity was assured and an item in the EDC construct was reverse coded to help prevent common method bias (CMB) (Podsakoff et al., 2012). Similarly, to

mitigate common source bias (CSB), team leaders assessed the GTC measures of their subordinates and themselves while other constructs were assessed by leaders and subordinates. Furthermore, congruent with Kock's (2015) recommendations for collinearity assessment, the variance inflation factor (VIF) result of 1.552 (See Table 2) shows that the highest VIF value is significantly below the threshold of 3.3. Hence, it can be inferred that CMB is not a major issue in this study (Kock, 2015).

Table 2: SmartPLS3 Factor Analysis

Construct	rho_A	VIF values	Composite reliability (CR)	AVE	PLS PREDICT RMSE	LM RMSE
Environmental dynamic capability	0.964	1.012	0.913	0.681		
Firm ownership	1.000	1.031	1.000	1.000		
Firm size	1.000	1.025	1.000	1.000		
Green performance and compensation	0.986	1.041	0.907	0.770		
Green product innovation (GPI)	0.854		0.886	0.722		
GPI4					1.687	1.892
GPI2					1.495	1.733
GPI3					1.763	1.848
Green recruitment and selection	0.903	1.503	0.936	0.829		
Green team creativity	0.884	1.009	0.926	0.807		
Green training, involvement and development	0.864	1.552	0.901	0.753		
ISO certification	1.000	1.013	1.000	1.000		
Technological turbulence	0.964	1.060	0.959	0.855		

3.2 Measures

The questionnaire was comprised of 7-point Likert scales, ranging from strongly disagree to strongly agree. Four items were adapted from Nejati et al. (2017) to measure GRS. An example is "This organization is very particular about mainly recruiting and selecting new employees with environmental concerns, knowledge and attitude". Cronbach's Alpha is 0.92 (Nejati et al.,

2017). Five items were adapted from Zaid et al. (2018) and one more from Nejati et al. (2017) to measure GPC. An example is "Organizational members' assessment comprises of their environmental performance". Cronbach's Alpha is 0.92 (Zaid et al., 2018). Four items were adapted from Zaid et al. (2018) and one more item from Nejati et al. (2017) to measure GTID. An example is "This organization offers ecological training for employees". Cronbach's Alpha is 0.94 (Zaid et al., 2018). Six items were adapted from Mittal et al. (2016) to measure GTC. An example is "This team member suggests new ways to accomplish environmental goals". Cronbach's Alpha is 0.94 (Mittal et al., 2016). Likewise, three items were adapted from Wu et al. (2017), and one item from Chavez et al. (2015) to measure TT. An example is "Technologies in this industry are rapidly changing". Cronbach's Alpha was 0.82 (Wu et al., 2017). Four items were adapted from Kawai et al. (2018) to measure GPI. An example is "When conducting product design or development, materials of product that produce the least amount of pollution is chosen by this organisation". Cronbach's Alpha was 0.8 (Kawai et al., 2018). Five items were adapted from Jansen et al. (2009) to measure EDC. An example of the reverse coded item is "In our market, nothing has changed in one year". Cronbach's Alpha was 0.91 (Jansen et al., 2009). As exemplified by Zailani et al. (2015), firm ownership, firm size and ISO certification status were controlled for as they have been shown to have significant effects on innovation.

3.3 Analysis

Partial least squares structural equation modelling (PLS-SEM) was employed for data analysis. We use PLS-SEM due to the soft distributional assumptions and model complexity, model specification and interpretation ease, and the prediction-oriented and exploratory nature of this study (Hair et al., 2016). PLS-SEM is also known to simultaneously address multiple dependency associations with higher statistical efficiency (Ringle et al., 2018). Further,

compared to alternative co-variance-based approaches, PLS is recommended since this study's primary objective has a causal-predictive nature rather than one of theory testing (Sarstedt et al., 2016). Therefore, SmartPLS3 has been employed for data analysis.

3.4 Results

Standard deviation (SD) results from descriptive statistics ranges from 1.5 to 2.0 and mean values of 5.1 to 6.0 suggest there is no substantial difference among the constructs examined in this study, given the relatively close construct scores. Likewise, skewness and kurtosis results ranged from -1.902 to 0.11 and -1.976 to 1.492 respectively. The results suggest a normal distribution (Hair et al., 2010). Figure 2 shows that all measurement items apart from GPC6 and EDC4 loaded above the recommended minimum threshold of 0.7 (Ringle et al., 2018). Nevertheless, according to Noor et al. (2018), items loading between 0.5 to 0.7 should be retained as long as composite reliability (CR) and average variance extracted (AVE) meet their required thresholds and their retention does not significantly hamper model integrity (Hair et al., 2010). Consequently, it can be concluded that all respective measurement items add substantial value to their examined constructs (Ringle et al., 2018).

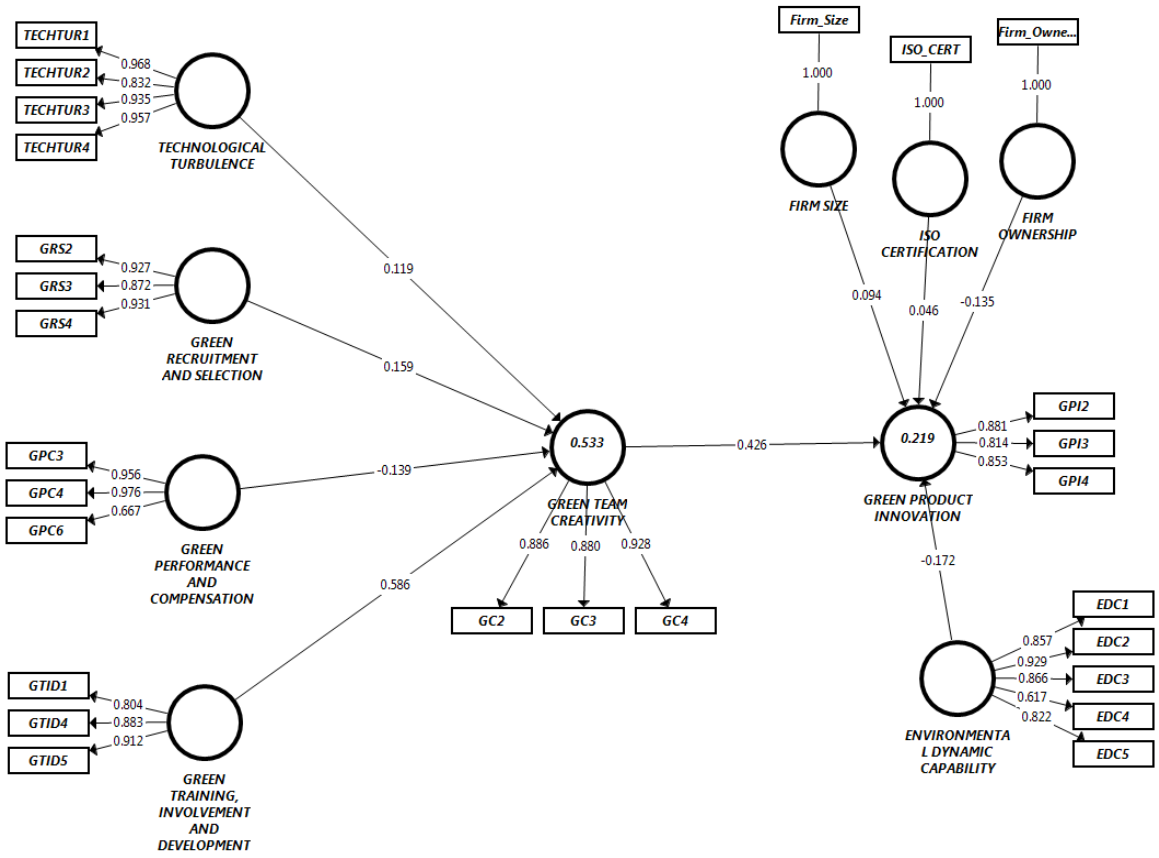

Figure 2: Measurement or Outer Model

Table 2: Heterotrait-Monotrait Ratio (HTMT) Test

Construct	EDC	FIRM OWN	FIRM SIZE	GPC	GPI	GRS	GTC	GTID	ISO CERT	TT
EDC										
FIRM OWN.	0.047									
FIRM SIZE	0.054	0.142								
GPC	0.077	0.013	0.016							
GPI	0.150	0.130	0.065	0.232						
GRS	0.116	0.068	0.046	0.058	0.465					
GTC	0.117	0.063	0.021	0.129	0.452	0.576				
GTID	0.072	0.115	0.110	0.102	0.663	0.656	0.788			
ISO CERT.	0.063	0.076	0.030	0.055	0.086	0.066	0.062	0.067		

TT	0.139	0.021	0.076	0.112	0.137	0.105	0.281	0.194	0.052

Note: Environmental dynamic capability (EDC), Firm ownership (Firm ownership), Green performance and compensation (GPC), Green product innovation (GPI), Green recruitment and selection (GRS), Green team creativity (GTC), Green training, involvement and development (GTID), ISO certification, Technological turbulence (TT).

Rho_A and CR values in Table 2 indicate the constructs' consistency and internal reliability, and the AVE values also confirm convergent validity (Hair et al., 2016). The heterotrait-monotrait ratio (HTMT) results of Table 3 indicate constructs' discriminant validity (Ogbeibu et al., 2018a). Table 2 also shows that multicollinearity is not a problem in this study, given that all VIF values are less than the threshold of 5 (Hair et al., 2016). With regards to model fit, Hair et al., (2019) strongly recommends that the use of model fit in PLS-SEM be done with excessive caution as the measures' assessments are yet incomprehensive, recently encouraged thresholds are very tentative, and the concept of model fit as in covariance-based SEM is of questionable value to PLS-SEM in general. Consequently, Sarstedt et al. (2017) and Ringle et al. (2018) advocate that estimations in PLS-SEM maintain a causal-predictive approach and should rely on the model's predictive accuracy and relevance (Q^2, β, *and* R^2).

Therefore, as a point of departure, the structural model has been estimated using the PLS bootstrapping preference and an overall model's statistical significance test of 5000 subsamples. R^2 values for GTC (R^2 = 0.533, t = 7.895, p=.000) and GPI (R^2 = 0.219, t = 3.882, p=.000) demonstrate moderate and relatively weak degrees of variance explained in GTC and GPI respectively (Sarstedt et al., 2017). Following the recommendations of extant research (Hair et al., 2019), inner model values of Figures 2 and 3 indicate that GTID is the strongest positive predictor of GTC, followed by GRS and TT. These results support the hypotheses **H1a, c,** and **H3**. Contrary to our initial theory, GPC is a negative predictor of GTC. So, **H1b** is significant

but not supported. Effect sizes (f^2) for GTID (0.474), GRS (0.036), GPC (0.040), and TT (0.028) had large, small, small, and small effects respectively (Ogbeibu et al., 2018a). Figures 2 and 3 also show that GTC is a positive and significant predictor of GPI, while EDC is a significant negative predictor. These results provide support for **H2 and H4**. f^2 values of GTC (0.230) and EDC (0.037) indicate medium and small effects respectively. Additionally, firm size is shown to have a negative influence on GPI while other control variables have non-significant effects in this study. Nevertheless, it is important to note that firm size had no meaningful effect (f^2=0.011).

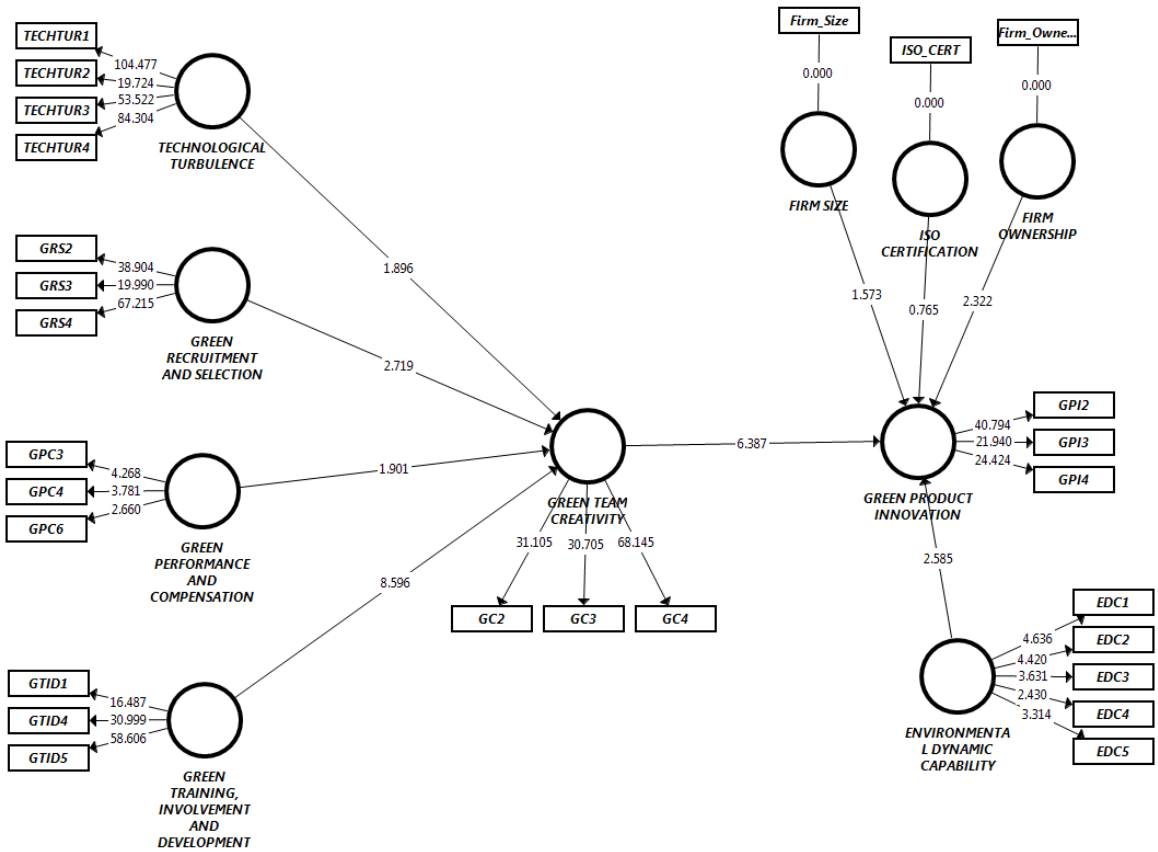

Figure 3: Structural or Inner Model

Furthermore, moderation analysis results indicate that TT (β = 0.024, t = 0.293, p=0.385) doesn't moderate the positive association between GPC and GTC as it is non-significant, so,

H5b is not supported. However, we find that TT strengthens (β = 0.109, t = 1.636, p=0.051) the positive relationship of GRS on GTC, but attenuates (β = -0.189, t = 2.711, p=0.003) the positive association of GTID on GTC. Thus, while **H5a** is supported, **H5c** is not supported.

To test for mediation effects, we follow the guides of extant research (Memon et al., 2018; Nitzl et al., 2016) to explore specific indirect effects. The results show that GTC is a complementary mediator of the relationships between TT (β = 0.050, t = 2.010, p=0.045), GRS (β = 0.068, t = 2.335, p=0.019), GTID (β = 0.249, t = 4.380, p=0.000) and their final target construct, GPI. These results support **H6a, H6b,** and **H6d**. Moreover, GTC is a competitive mediator of the relationship between GPC (β = -0.059, t = 1.868, p=0.062) and GPI. This result is significant and does confirm the initial **H6c** theorization.

Given our model's predictive relevance, the Q^2 of GTC (0.413) and GPI (0.135) indicate an acceptable level of predictive relevance and support for predictive accuracy (Shmueli et al., 2016). Finally, to assess our model's out-of-sample predictive power, we used the PLS predict procedure with 10 folds and 10 replications and compared PLS-SEM RMSE values with those from a naive linear benchmark (RMSE of the linear model (LM)) in the PLS predict output. As a rule of thumb for prediction models (Shmueli et al., 2019), lesser values (*lower prediction errors)* for all PLS-SEM RMSE (or MAE) measurement indicators contrasted with all those of the LM RMSE, suggests high predictive power. While lesser values for a majority of measurement indicators of PLS-SEM RMSE contrasted with those of the LM RMSE relates medium predictive power, lesser values for a minority of measurement indicators of PLS-SEM RMSE contrasted with those of the LM RMSE connotes minor predictive power. Additionally, higher values for all the measurement indicators of LM RMSE contrasted with those of the PLS-SEM RMSE (or the MAE), signifies a lack of predictive power for the model. Results, therefore,

indicate lower prediction errors in PLS-SEM RMSE analysis compared to the naive benchmark highlighted in the LM RMSE output (See Table 2), thus, offering support for our model's large predictive power.

4. Discussion and Conclusion

Congruent with the debates of extant literature (Jabbour and Jabbour, 2016), our study demonstrates that all GHRM bundles are significant predictors of GTC. However, while GTID and GRS are positive predictors of GTC, GPC is demonstrated to be a negative predictor. Our finding on GTID complements the discourse of Teixeira et al. (2012) and Jabbour (2013) which emphasises on how GTID positively influences team members' environmental awareness and drives their education and development of environmental sustainable values. In this context, consistent application of such values may help align team members' focus towards further generation of green creative ideas and subsequent GPI implementations (Muenjohn and McMurray, 2017). Likewise, by demonstrating the influence of GRS in positively predicting GTC in a different cultural context, our study stretches related insights espoused in the works of Siyambalapitiya et al. (2018) and Masri and Jaaron (2017). Yong et al. (2019) further contend that GRS tenets could be the core element organisations could deploy to initially advance implementations of eco-friendly innovations even in manufacturing organisations. This notion to foster environmental sustainability is further supported by Jia et al. (2018) who argued concerning the need to also give core considerations towards the importance of having a green centred creative workforce. By further expounding on the concept of GTC, our study holds a supplementary position to prior research (Song and Yu, 2017). It is, therefore, important to note that the quest to underpin environmental sustainability may often involve consistent additions, review and control of green job descriptions (Renwick et al., 2016). Although Yong et al. (2019)

found that green job descriptions have no significant influence on sustainability, prior research (Fields, 2017) support that this approach could help realign teams' creative ideas, and guide their green creativity towards increased innovation of green products,

Nevertheless, GPC being a negative predictor stands in dissonance to the findings of prior works (Nejati et al., 2017; Roscoe et al., 2019). This finding is also contrary to the relative findings of Yong et al. (2019) which found no significant influence of GPC. Moreover, GPC being a negative predictor was unexpected. This outcome could be a consequence of inadequate environmental guidelines or environmental policies that are not quite supportive of GTC (Marcus and Fremeth, 2009). Exclusion of adequate green performance indicators or inclusion of stringent tenets advocated by rigid GPC standards has been argued to produce a negative impact on the degree to which creativity could be exerted (Jiang et al., 2012; Renwick et al., 2013). It is also important to highlight that poorly communicated schemes embedded in GPC could also hamper a team's efforts to exert green grounded creative behaviours (Ahmad, 2015). Consequently, Arulrajah et al. (2015) recommend that leaders ought to ensure that a firm-wide dialogue on green concerns is adequately established to foster effective communication of green schemes.

Likewise, creating GPC targets and green responsibilities that are too high or poorly defined is likely to provoke less creativity and further make GPI unrealisable, especially when a team's creative efforts are influenced by constant technological turbulence (Chen et al., 2018; Jiang et al., 2012). This negative impact on GTC has also been supported in the discourse of prior research (Zaid et al., 2018; Zoogah, 2011). Additionally, the negative impact of GPC is likely an outcome of environmental policies on compensations and rewards that are ineffectively implemented or overlooked, thus dampening the drive to exhibit creative behaviours by team

members (Nejati et al., 2017; Zhu et al., 2016). Studies emphasize the need to adequately inspire creativity by giving apt consideration to developing schemes that compensate green-centred and creative ideas suggested by green teams (Kim et al., 2019).

Similarly, our study is consistent with the assertions of prior literature in that TT is found to positively predict GTC (Huang et al., 2014; Wu et al., 2017). Given that businesses are pursuing continued maintenance and possibly increased competitive advantage, learning-centred organisations are now beginning to embrace the impacts of TT as a positive influence on green teams who feel constantly motivated to exert high levels of creativity (Herath et al., 2017; Jiang et al., 2012; Wu et al., 2017). The demands created by TT compels green teams to be more engaged in creative initiatives. Our study also contributes to prior debate that has argued for the positive association between GTC and GPI (Chan et al., 2016; Jiang et al., 2012). We found that although GTC may enhance GPI, a dynamic business environment negatively influences GPI, and this is consistent with the deliberations of extant research (Huang et al., 2014; Jansen et al., 2009). Extant research, therefore, espouses the idea that leaders need to cautiously apply green centred strategies that identify with respective EDC when implementing GPI (Chan et al., 2016).

Moreover, we found that TT strengthens GRS's impact on GTC. GRS processes have been shown to have a positive association with GTC, and, congruent with our findings, several researchers (Huang et al., 2014; Wu et al., 2017) contend that the presence of TT can provoke teams to exhibit more creative behaviours. This outcome is important to ensure organisational survival in the long run (Bai et al., 2016). Likewise, our findings show that TT attenuates the positive impact of GTID on GTC. This finding is consistent with extant literature which advocates that although GTID is a necessary GHRM bundle which can facilitate GTC, the presence of constant TT may likely leave a green team frustrated and less motivated to be

creative (Chen et al., 2018; Jansen et al., 2009). Likewise, constant increases in TT may mean a continuous rise in the levels of GTID due to the need to constantly maintain and increase competitive advantage (Chen et al., 2018). Similarly, green teams may tend to put in much effort into exerting high-level creativity to meet the disruptive demands of constantly evolving technologies. Green teams can, therefore, be overwhelmed by increasingly dynamic responsibilities as they are constantly compelled to obtain new skills and learn and adapt to using new software (Chen et al., 2018). This could further distort their career orientations as some skills may become increasingly complex to learn and adopt (Wipulanusat et al., 2018). In the long run, organisations might end up losing relevant human capital as team members willingly retire, go work elsewhere or even switch into other career paths which are more compatible with their capabilities and skills (Herath et al., 2017). Consequently, the positive effects of GTID on GTC are likely to have a less positive impact as even willing green team members become overburdened with constant GTID-related initiatives.

Furthermore, congruent with extant research (Chen et al., 2018; Jiang et al., 2012), our findings show that GTC transfers the positive impacts of TT, GRS, and GTID to GPI. Thus, we find that GTC is not only a positive mediator, but also a catalyst which plays a complementary role. Conversely, GTC acts as a competitive mediator in that it acts against or diminishes the relationship between GPC and GPI. This could be because green teams who are already negatively impacted by GPC may feel less likely to commit towards green centred creativity initiatives. This argument is consistent with extant research (Ahmad, 2015; Zhu et al., 2016) which further supports the idea that the less inspired team members get, the less likely they will be to exert creative behaviours that foster environmental sustainability. Studies, therefore, explain the importance of ensuring that GHRM practices are sufficiently aligned so that they

adequately identify with motivation schemes that inspire rather than dampen creativity among green teams (Ahmad, 2015; Chen et al., 2018).

4.1 Implications for Theory and Practice on Sustainability

Although the literature is replete with studies that may have examined how HRM influences innovation, only a handful of studies have investigated the connection between GHRM and innovation-related concepts. We thus extend prior traditional HRM concepts to reflect a more environmentally sustainable GHRM framework. As a major gap in prior research, our study is among the first to have considered the distinct roles of TT and GTC and how they act to inhibit or foster GHRM bundles to predict GPI. We thus attempt to provide significant evidence which compliments the propositions of the stakeholder theoretical underpinning for sustainability. By demonstrating the negative role of GPC, our study challenges prior contrasting insights from extant literature that have been undergirded by the stakeholder theory. Equally, by evidencing how GTC and TT influence the predictive powers of the GHRM bundles on GPI, we deepen prior contemporary knowledge which offers further theoretical support for environmental sustainability. Given the growing global warming concerns and environmental pollution, this study couldn't be more timely and relevant to manufacturing organisations across developing and developed economies. We, therefore, provide novel and substantive support that provokes apt and pertinent insights for practitioners and policy implications. We also take into account the influence of a dynamic business environment on GPI. We thereby advance the tenets of stakeholder theory by providing insight into how the much overlooked GHRM undergirding of some organisations contributes to environmental sustainability. By considering how GHRM contributes toward fostering GPI, we implicitly show how our study identifies with environmental sustainability concerns in a way that is plausibly beneficial to all stakeholders

alike. Consequently, we expand prior insights by demonstrating that all GHRM bundles and TT have significant but differing relationships with GTC.

We show that GTID is a more significant predictor of GTC than GRS and TT. As a result, policymakers and practitioners need to intensify and reinforce their GTID strategies as this has been shown to have a more significant connection with GTC. Organisational policies could be refined to ensure teams are consistently trained on green-related practices. It is also important for teams to have a sense of inclusion when developing strategies, as this could bolster their motivation to remain as part of their respective green teams. Likewise, leaders may attempt to initiate green schemes that support teams in acquiring external training or programs tailored toward green skills development. We provide evidence which supports that GPC is a negative predictor. Hence, practitioners ought to aptly enforce GPC standards with some degree of flexibility that doesn't use excessive force and control. This is important to make teams feel more willing to commit towards green creativity initiatives.

We also show that TT acts as a positive predictor and a positive and negative moderator. We thus, advance prior results by demonstrating that TT isn't solely a positive predictor of GTC but also a reinforcer of the positive relationship between GRS and GTC. Similarly, practitioners can more confidently apply related strategies with the knowledge that TT is not often a negative antecedent of GTC but actually a facilitator. Likewise, policies may be further instituted to ensure GRS processes are constantly re-evaluated to align with constantly evolving technologies. We demonstrate that TT also attenuates the positive association between GTID and GTC. So, leaders ought to note that while GTID is a large predictor of GTC, the presence of TT is likely to dampen GTID initiatives that could have otherwise stimulated GTC. Thus, training, inclusions and development programs ought to be applied with careful consideration of already well-

established technologies. GTID initiatives should not always be identified with new technologies as this might cause green teams to become strained or overburdened with increasingly dynamic responsibilities and pressures. Similarly, it could cause work-life balance conflict for teams that may feel compelled to devote most of their time to their work and less time to their personal lives or other responsibilities.

We also extend prior understandings of the GPI underpinning by showing that GTC and EDC are distinctive predictors. We show that while GTC positively predicts GPI, EDC is epitomised as a negative predictor. Policymakers should to take into account the negative role of EDC, as EDC can provoke increased stress, ambiguity, and even crises among organisational members who undermine it. Sufficient resources and measures should, therefore, be instituted to the constant re-evaluation of current conditions and for the forecasting of probable directions of an organisation's business environment. This is relevant for aligning GPI objectives with current or anticipated environmental projections. Furthermore, we extend previous insights by providing evidence that supports the idea that GTC is a complementary and competitive mediator. Practitioners should, therefore, note that while GTC may have previously been advocated to transfer and strengthen the positive associations of GHRM bundles and TT with GPI, it worsens the negative relationship of GPC with GPI. Consequently, policymakers may want to ensure green centred audits and management systems, objectives and targets, corporate-wide performance principles, "green" criteria appraisals and progress monitoring are all thoroughly and regularly reviewed with constructive feedback, adequate and timely compensation, and some degree of flexibility. This is relevant for reducing a plausible consequence of teams feeling excessively controlled and monitored, stressed and pressured. This potential consequence of a negative link between GPC and GPI has thus, been evidenced in our study.

4.2 Limitations and future research directions

Our study used a team-level analysis, so organisational-level implications ought not to be inferred. This, however, provides an opportunity for future research into an organisational-level analysis that could deepen insights into green organisational creativity. Implicitly grounded on the tenets of the stakeholder theory, our study did not directly examine the perceptions of shareholders, suppliers, customers, societal or corporate level factors, as such divergence would have directed our focus in contrary directions to our main study aim. It is, therefore, important for future researchers to consider incorporating factors stemming from the aforementioned concepts into a similar investigation. This study is cross-sectional, although data collection was done in a way that might reflect a similitude of a longitudinal study. To facilitate more robust insights, our study may be replicated using a longitudinal approach. Furthermore, our findings ought to be generalised with caution, as our study investigated mainly 31 manufacturing organisations. Nevertheless, more organisations across the manufacturing industry could be added by future research. Our results and insights might thus, help other countries and industries to be more engaged in industrial activities which are more environmentally friendly and supportive.

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Appendix

List of Measurement Items	
Green Recruitment and Selection (GRS)	Green Performance and Compensation
1. This organization is very particular about mainly recruiting and selecting employees with environmental concerns, knowledge and attitude. 2. This organisation's recruitment process, our organisation 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.	1. Environmental goals and objectives for leaders are implemented in this organisation. 2. Assessment of leaders comprises of their environmental performance. 3. Organizational members' assessment comprises of their environmental performance. 4. There is compensation of non-monetary incentives for achieving targeted environmental performance. 5. Variable compensation payment is based on environmental performance. 6. Through organisation's environmental awards, employees get recognized for implementing initiative for environmental management.
Green Training, Involvement and Development (GTID)	Green Team Creativity
1. This organization offers ecological training for employees. 2. This organization 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	1. This team member suggests new ways to accomplish environmental goals. 2. This team member propose new green ideas to improve environmental performance. 3. This team member promote and champion new green ideas to others. 4. This team member develops adequate plans for the application of new green ideas.

ecological training have the opportunity to implement green knowledge in everyday activities.

Technological turbulence (TT)

1. Technologies in this industry are rapidly changing.
2. Big opportunities are provided as a consequence of technological changes in our industry.
3. Forecasting technological developments in our industry is quite difficult.
4. In our industry, newly developed processes and technologies can easily become out dated.

Environmental Dynamic Capability (EDC)

1. In our market, nothing has changed in one year (reverse coded).
2. In our local market, environmental changes are intense.
3. There are regular requests for new services and product by our clients.
4. There are continuous changes in our local market.
5. There is a rapid and frequent change in the volume of services and products in our market.
5. This team member would rethink new green ideas.
6. This team member would find out creative solutions to environmental challenges.

Green Product Innovation (GPI)

1. When conducting product design or development, materials of product that produce the least amount of pollution is chosen by this organisation.
2. This organisation chooses product materials that consume the least amount of resources and energy for conducting product design or development.
3. When conducting the product development, this organisation uses the least amount of materials to comprise the product.
4. When conducting product designs or development, this organisation would cautiously evaluate whether the product is easy to decompose, reuse, and recycle.

- Green HRM bundles positively and negatively predict green team creativity.
- Technological turbulence is a negative and positive moderator.
- Environmental dynamic capability negatively predicts green product innovation.
- Green team creativity is a complementary and competitive mediator.
- Technological turbulence positively predicts green team creativity.

CONFLICT OF INTERESTS

The authors do not have any conflict of interests in light of this or any affiliated submissions to the Journal of Cleaner Production.