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# Does the Environmental Management System Predict TBL Performance of Manufacturers? The Role of Green HRM Practices and OCBE as Serial Mediators

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**Abstract:** Over the years, Malaysian manufacturers struggled to mitigate the widened gap among the three aspects of TBL performance, e.g., economic, social, and environmental. Although, the economic performance is relatively elevated compared to environmental performance based on environmental performance index (EPI) data reports. Similarly, less than twenty per cent (20%) of manufacturers are ISO14001-certified out of the total registered firms in the 52nd FMM directory. The firms must employ green HRM practices to foster pro-environmental behaviour and support their managers to adopt the environmental management system (EMS) framework to reap the benefits of TBL performance. To resolve these issues, sustainability has become an essential strategy for manufacturers in addressing environmental problems due to consistent ecological awareness among stakeholders that compels firms to adopt EMS and green HRM practices to foster organizational citizenship behaviour for the environment (OCBE) and improve triple bottom line (TBL) performance. This research aimed to investigate the impact of the EMS on TBL performance through green HRM practices and OCBE via a serial mediation approach among ISO14001-certified manufacturing firms. A quantitative methodology was employed based on a positivist paradigm. The sample of 350 respondent firms was randomly targeted via standard questionnaires. Around 248 manufacturers responded with a response rate of 70%, which is sufficient for data analysis. After outliers and normality assessment, the clean data of 216 manufacturers were finally analysed using SmartPLS 4.0. Structural equation modelling (SEM) analysis revealed that EMS is positively related to OCBE, and OCBE is positively associated with TBL. EMS is positively related to green HRM practices, and green HRM practices are positively associated with OCBE. Furthermore, it was confirmed that green HRM practices and OCBE serially mediated the relationship between EMS and TBL performance among ISO14001-certified manufacturing firms. The current study also presents vital organizational and managerial implications.

**Keywords:** environmental management system; green HRM practices; organizational citizenship behaviour towards the environment; triple bottom line performance; serial mediation approach



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## 1. Introduction

The manufacturing industry is the backbone of the Malaysian economy and significantly contributes to the gross domestic product (GDP). Manufacturing is the main strength of the Malaysian economy, as evidenced by the figures published by the Ministry of International Trade and Industry (MITI), showing that it accounts for approximately 23.80% of the

Malaysian GDP [1]. However, this comes with the cost of environmental degradation and results in an imbalance among three critical aspects of triple bottom line (TBL) performance, e.g., the economic, social, and environmental [2].

In the last decade, manufacturers struggled to mitigate this imbalance among the three components of TBL performance. Although, the economic performance is relatively elevated compared to environmental performance based on data published in the environmental performance index (EPI). Similarly, other issues also complicate this problem as only less than twenty per cent (20%) of total registered firms are ISO14001-certified in the 52nd FMM directory 2021 [3]. Besides green HRM practices, manufacturers made sustainable efforts by pushing their employees to foster pro-environmental behaviours (PEBs) and supporting their managers to adopt the EMS framework to reap the benefits of TBL performance [4].

Not just green HRM practices but also the PEBs of the employees are also important in this regard because of their beneficial impact on the firm's sustainability efforts. However, they are still at the infancy stage of their growth trajectory in case manufacturing firms and received extraordinary attention from researchers. Among the most important types of PEBs, e.g., organizational citizenship behaviour towards the environment (OCBE), is at the centre stage of research within corporate sustainability. Scholars call this voluntary type of PEB the fundamental element of corporate greening and elevating TBL performance. The literature has argued that the organization cannot have desired results until its employees across managerial levels ensure engagement in OCBE.

In contrast, indirect PEBs can participate in environment-related initiatives [5]. Apart from this, five taxonomies of green behaviours have been presented in the literature, elaborating on the salient features of OCBE [6,7]. Scholarly efforts have been made to find contextual factors embedded at the employees and management level [8,9]. Still, the current state of literature necessitates a further empirical examination of antecedents of OCBE at the corporate level so that managers are better equipped to enhance the TBL performance of their firms. Knowing the antecedents of OCBE can also improve the effectiveness of EMS [10,11]. We acknowledge the recent scholarly contribution to understanding how environmentally friendly behaviours, e.g., OCBE, can improve TBL performance. Yet, previous research can better guide how green firms can elevate TBL performance by employing green HRM practices and adopting EMS ISO14001 [12].

Malaysian manufacturing industries are looking forward to assuring sustainable manufacturing culture and performance by adopting EMS initiatives to reduce the negative impact on the environment. The drive for green HRM practices and EMS initiatives in the manufacturing sector has gained momentum since the beginning of the new millennium. Manufacturing industries have been making efforts by shifting traditional manufacturing practices to more sustainable ones such as integrated environmental management systems. Recent research on the new trends in the manufacturing industry proposed that digital technology can enable the process of green manufacturing and mitigate the barriers. The pressure-state-response (PSR) model can use digital technology to allow green innovation in the manufacturing industry. This study not only proposed an evaluation index system of the digital green innovation level but also put forward policy and practical guidance of digital technology to accelerate the green and intelligent manufacturing industry [13]. The research scholars unanimously agreed that manufacturing companies should become more sustainable, but this will not happen without green HRM practices. Paradoxically, there is a lack of implementation of green HRM practices for organizational sustainability in actual cases. In addition to guaranteeing TBL performance, the companies must instil green HRM practices by bridging the gap between green HRM practices and EMS initiatives.

There is a considerable gap in the literature to study the integration of green HRM practices and EMS initiatives by highlighting micro- and macro-level factors. Thus, researchers show the growing concern for researching the integration of EMS initiatives and green HRM in practice. Similarly, previous studies have exposed that research is needed to investigate the synergetic link between green HRM practices and EMS initiatives to achieve organizational sustainability objectives [14,15]. Most small manufacturing firms face various obstacles to adopting green initiatives in Malaysia [16,17]. Despite this significant importance, little research has been done to integrate green HRM practices and EMS initiatives to achieve organizational and environmental sustainability [18,19].

The current study investigates the relationship between green HRM and EMS initiatives at the organizational level. Bridging the micro and macro aspects of green HRM and EMS initiatives would ensure that manufacturing organizations develop green sustainable culture. OCBE is another micro-level factor that enables the employees to modify the traditional behaviour towards environmentally oriented behaviour as a macro-level factor in the long run. The diffusion of EMS is a prerequisite for creating a green synergetic effect to improve organizational TBL performance. However, based on a literature review, scant research has been published on the impact of EMS on TBL performance in the context of ISO14001-certified firms. Researchers have yet to investigate the serial mediation role of green HRM practices and OCBE on the relationship between EMS and TBL. The present research bridges this gap in the literature by examining the relationship between key constructs, e.g., EMS, green HRM practices, OCBE, and TBL, and investigating the role of the green HRM practices and OCBE as serial mediators on the relationship between EMS and TBL among ISO14001-certified Malaysian manufactures.

#### *Research Objectives*

So, in a nutshell, the current study objective study is threefold; (i) to investigate the relationship between EMS and OCBE in predicting TBL; (ii) to investigate the relationship between EMS and green HRM practices in predicting OCBE; (iii) to test the serial mediating role of green HRM practices and OCBE on the relationship between EMS and TBL among ISO14001-certified manufactures. To offer guidelines for the manufacturing industry and modify the traditional behaviour towards being more pro-environmental, e.g., OCBE. The rest of the paper is organized as follows; the next section discusses a detailed review of the literature on the hypothesized relationship between the study variables and the research model with theoretical justification. The following section explains the research method employed and the data collection processes. The data analysis presents SEM result interpretation. The last section elaborates on theoretical and empirical findings and discussion alongside organizational implications, followed by fundamental research limitations, future recommendations, and a conclusion.

## **2. Literature Review and Hypotheses Development**

In this section, a detailed review of literature on each variable and their relevant concepts are discussed, e.g., exogenous variable (i) environmental management system (EMS), mediating endogenous (ii) green HRM practices, (iii) organizational citizenship behaviour for the environment (OCBE), and (iv) endogenous variable triple bottom line (TBL) performance. The following section discusses the formulation and development of each hypothesized relationship, followed by the research model and theoretical justification.

### *2.1. Hypotheses Development: Environmental Management System and Organizational Citizenship Behavior towards Environment*

The international organization for standardization (ISO), in collaboration with the international electrotechnical commission (IEC), organized a committee to develop environmental standards [20]. Later the committee assigned the task of evaluating and managing the development of an environmental management system (EMS) [21]. The year 1996 witnessed the birth of the very first EMS ISO14001, which was refined in later years, such

as in 2000 and 2004. Organizations are increasingly adopting EMS ISO14001 across industries worldwide [22,23]. Managers tend to have a favourable view of the EMS as it allows the firms to gain from a TBL performance perspective. The EMS can help managers identify resource-efficient, environmentally friendly initiatives [24]. Based on the literature reviewed, we contend that as an EMS is geared towards benefitting the environment, it will likely have a motivational impact on the employees.

To establish our hypothesis, we further propose that an EMS ISO14001 standard is voluntary in nature, meaning that no external stakeholder can forcefully compel the organizations to adopt it [25]. This voluntary adoption leaves a positive impression not only on the external stakeholders, such as regulators, shareholders, and general media but also on the internal stakeholders of the firms, e.g., employees and managers. Integrating EMS into the organizational processes voluntarily conveys the message to the broader audience, including employees, that the firm has the best interest of society and the environment. Employees are influenced by the negative and positive firm's environmental actions [26]. These actions impact the behaviour and attitudinal outcomes at the employee and corporate levels [27]. Corporate social responsibility, for example, has been noted to be an important driver of employee behaviours and attitudes [28,29].

The past research established theoretical and empirical associations between organizational practices and their employee-level outcomes to support our proposed arguments. For instance, Khan et al. [30] have found that the EMS shares a positive relationship with OCBE in manufacturing industries. As an EMS is a construct that operates at an organizational level, we propose the relationship between these constructs, as demonstrated in the previous studies. Thus, we posit that the EMS is a corporate mechanism that has the potential to send social signals to employees and consequently alter their traditional behaviours into pro-environmental ones. Moreover, as EMS inherently presents environmental guidelines, it can be reasoned that it will positively affect OCBE. We also mentioned in prior literature that it links EMS and pro-environmental behaviours on the part of employees, too [31]. Thus, we propose hypothesis **H1**: EMS is positively related to OCBE among ISO14001-certified firms.

## *2.2. Organizational Citizenship Behavior towards Environment and Triple Bottom Line Performance*

Organizational citizenship behaviour for the environment (OCBE) involves discretionary efforts and behaviours and has crucial implications for management [32]. Other research revealed that OCBE predominantly represents staff's voluntary actions and motivation to take up environmental initiatives [33,34]. Triple bottom line (TBL) is conceptualized and measured based on three elements: (i) economic, (ii) social, and (iii) environmental. Firms can only achieve excellent TBL performance if they are well-versed in managing the intricacies and variabilities of these three elements.

It is a well-established fact that the firm uses the TBL strategy formulated by the top-level management and consequently articulated among the middle and line managers. TBL is an essential determinant of the desired environmental, social, and financial objectives in elevating the firm's performance and productivity [35,36]. However, a consensus exists among organizational theorists that in cases where employees are not engaged in TBL initiatives, it affects the efficiency and effectiveness of the firm [37,38]. Employees are essential to this equation as they complement such TBL mechanisms with their behaviour and attitudes [39]. For example, a policy aimed at internet usage at work will not yield desired results in the absence of cooperative and compliant employees who adhere to the company policy of not utilizing the internet facility of the company for personal usage [40]. Similarly, in the sustainability literature, scholars assert that employees are fundamental to the success of any green organizational rules, procedures, and policies [41]. Most of the eco-behaviours referred to in the above discussion reduce the wastage of resources and enhance the sustainable operations of the firm, thereby resulting in the rise of the TBL performance of the firm [42].

Apart from the above discourse to assume our hypothesis relating OCBE and TBL performance of the firm, previous empirical literature suggested that employee behaviour at the micro-level also impacts macro-level OCBE in improving firm TBL performance [43]. For instance, some scholars in the literature revealed that counterproductive behaviours, e.g., knowledge-hiding, negatively impacts a firm's TBL performance [44]. Another stream of researchers believed that employee performance is one of the essential predictors of the firm's TBL performance [45]. Research on employee creativity has also shown that being creative on the part of workers ultimately benefits the firm's TBL performance [46,47]. In a nutshell, employees' overall aggregate voluntary green behaviours yield positive benefits for TBL's firm performance. Similarly, previous studies provide empirical support to propose a relationship between OCBE and TBL performance. Based on a literature review, our discussion formulated and assumed the hypothesis **H2**: OCBE is positively related to TBL Performance among ISO14001-certified firms.

### *2.3. Environmental Management System and Green Human Resource Management (Green HRM) Practices*

Researchers in the sustainability field sought to relate sustainability with human resource management (HRM) practices resulting in sustainable HRM, which is relatively in the nascent stage [48]. Previous research looked at corporate sustainability and environmental management through the perspectives of the Harvard approach and human relations. Four theoretical approaches have been applied to associate HRM with sustainability. They included green, psychological, sociological, and strategic (see Mazur [49]). These approaches are essential in understanding how the evolution of sustainable HRM gained attention among scholars. For instance, the psychological perspective indicates the psychological underpinning of what the employees prioritise. The sociological approach theoretically interlinks the employee, employer, and society with each other. On the other hand, the strategic perspective is based on the resource-based view (RBV), explaining how the firms exploit their resources and invest in human resources to achieve a competitive advantage [49]. The contemporary theoretical perspective utilized by sustainability researchers results in green HRM, which seeks to develop green practices at the firm level, e.g., green recruitment, green performance management, and green training, among others [50].

EMS is a primary framework that facilitates firms and enables managers to fulfil sustainable goals [51]. Similarly, it helps managers establish clear benchmarks for environmental objectives and objectively measure TBL performance. Furthermore, EMS is globally recognized, and it also provides how to incentivise managers to align organizational practices, e.g., supply chain, marketing, finance, and HRM, with environmental objectives [52]. Therefore, we contend that EMS can lead to greening HRM practices. Managers find it convenient to have a template of EMS standards to balance their concern for the environment and the firm's financial performance. Usually, the adoption and implementation of EMS can be supervised at the strategic level [53].

That is, socially conscious and environmentally responsible top management usually undertakes strategic-level decisions in response to the demands and expectations of internal and external stakeholders such as the media, the general public, and overall society [54]. Afterwards, once the decision is made to integrate EMS into the organizational practices, the top management must articulate this among middle and line managers in order to ensure the trickle-down effect of green policies from top to bottom. It is important to note that the job autonomy of middle and line managers, as well as employees, is a critical component that affects the extent to which the EMS framework, e.g., ISO14001, gets successfully absorbed into the organizational functions, practices, rules, and regulations [55]. Various other factors, such as leadership style and organizational context, can potentially moderate the extent to which the EMS successfully gets translated into organizational practices.



For instance, the green recruitment and selection processes focus on shifting candidates' mindsets from job-related knowledge towards green credentials, experience, knowledge, skills, and abilities [56]. Green HRM also embeds the element of sustainability into the training and developmental practices, allocating adequate resources to invest in the employees' green competencies, including environmental assessment and rewards [57]. EMS integration into an organization has become a vital standard to measure sustainable outcomes and reward employees' environmental performance [58]. The empirical and theoretical association has been established between the EMS and green HRM based on a literature review. Thus, we hypothesize **H3**; EMS is positively related to green HRM practices among ISO14001-certified firms.

#### *2.4. Green Human Resource Management Practices and Organizational Citizenship Behavior towards Environment*

Green HRM represents the most recent theme in the scholarly evolution of sustainable HRM. Literature has confirmed that green organisations' recruitment and selection practices attract more job applicants due to their environmental reputation [59]. Job applicants prefer to work in organizations where their objectives align with environmental values in contributing to corporate social responsibility (CSR). Similarly, research suggested that organizations that adopt initiatives resulting in environmental benefits earn admiration from society and consequently cultivate a good reputation for themselves [60]. This concept of green HRM practices is centred on the notion that organizational practices can be helpful in terms of dealing with environmental issues. For instance, organizations are shifting their focus towards green credentials, pro-environmental knowledge, experience, and green skill sets and abilities. To achieve these objectives, they must embed sustainability into the training and developmental practices by allocating adequate resources. The green HRM practices, e.g., assessment and rewards, must also be geared towards sustainability and environmental objectives. Accordingly, the literature illustrates the seminal work regarding green HRM consisting of three prominent practices, e.g., (i) green recruitment, (ii) green training and development, and (iii) green performance management. Research also empirically evaluated green engagement and green employee relationships. Forward-looking and environmentally responsible organizations are putting their best efforts into becoming environmentally accountable [61,62].

Thus, these organizations encourage managers to integrate sustainability into their managerial practices [63]. Due to this significance, green HRM can play a key role in the survival and firm overall success of TBL performance. Thus, firms increasingly adopt green HRM practices to ensure sustainability in their managerial structure [64]. Similarly, these green initiatives can be used as an essential tool for the organization to gear the behaviours of employees and managers towards sustainability. Therefore, green HRM practices' implication has received attention in empirical and theoretical debates among organizational scholars [63,64]. As outlined in the previous section on green HRM practices, it attracts environmentally conscious job applicants and selects the best among them [65].

Consequently, green training and development-related practices of the company then come into play and enhance the employees' capabilities in performing their tasks and duties in an environmental-friendly manner [66]. Such environmental training initiatives aim to foster the employees' green skill set.

Afterwards, the organization must assess how employees demonstrate environment-friendly behaviour while performing daily tasks and routine duties [67]. Once the organization has evaluated the green performance of an employee, the rewards are also a key consideration. Green rewards are conferred upon those who do well in terms of their environmental performance at the workplace. The primary focus of organizational scholars examining corporate greening confirmed that it could play an influential role from the perspective of employees' pro-environmental behaviours [68]. Apart from this CSR of the firm has also been considered as the antecedent of employees' pro-environmental behaviours (PEBs) [69]. Adopting PEB not only encourages those who are good at it but also acts

as a source of inspiration and encouragement for others to follow and imitate excellent performers. Research studies have revealed that green HRM practices foster voluntary green behaviours in the hotel industry. Other studies' findings confirmed the relationship between green HRM and OCBE [70]. Based on the literature review, we hypothesize **H4**: green HRM practices are positively related to OCBE among ISO14001-certified firms.

#### *2.5. Mediating Role of Green HRM Practices*

The macro-level factors, e.g., green HRM practices, can elevate firm performance and improve a firm financial success [71]. Green HRM adoption strategy must be aligned with the mission, vision, and industry environmental standards, e.g., EMS ISO14001 and top management support are mandatory for overall success [72,73]. These green initiatives operate through a 'trickle-down effect' through the diffusion of EMS, enabling the firm to achieve TBL performance [74].

Similarly, EMS is an essential element in improving a firm's performance. As mentioned earlier, it is the robust and globally recognized analytical framework to manage environmental performance and enable managers to outline a firm's environmental strategy. With the help of EMS standards, senior management quantifies the firm's environmental objectives.

More importantly, EMS is a key enabler for senior managers in streamlining and 'greening' their managerial practices, such as green HRM, green supply-chain management, green marketing, accounting, and finance. In this process, senior managers take the middle management on board in enabling green initiatives, providing direction and support through resources, etc. The middle managers from the HR department then craft and contextualize the green HRM practices in the light of the central EMS framework [74]. Almost all the fundamental green HRM practices, e.g., recruitment, training, and performance evaluation, are streamlined through a green perspective. Thus, we argue that the EMS eventually translates positive effects through green HRM practices that, in turn, affect the work-specific employees' PEB.

More specifically, when employees put in their best efforts and become intrinsically motivated to engage in PEB, it results in fostering OCBE. Previous studies have confirmed that green HRM practices can be used as a mediator in the relationship between the EMS and OCBE. Recent research by Úbeda-García et al. [75] has revealed that green HRM plays a mediational role in the relationship between CSR and firm performance. Islam et al. [76] have encountered empirical evidence for the mediational effect of green HRM on the relationship between ethical leadership and employees' voluntary green citizenship behaviours through integrating the theoretical perspectives of social learning and supply-value fit theories.

In another research conducted in the hotel industry of Manilla, Philippines by Haldorai, Kim, and Garcia [53], the study finding indicated that green HRM mediates the relationship between the green commitment and green intellectual capital of the top management and the hotel's environmental performance. Therefore, based on the literature, we conclude and hypothesize **H5**: green HRM practices mediate the relationship between EMS and OCBE among ISO14001-certified firms.

#### *2.6. Mediating Role of Organizational Citizenship Behavior towards the Environment*

Having established the theoretical association between EMS and OCBE, as well as between OCBE and TBL performance, in this section, we will focus on the mediating role of OCBE in the proposed relationship. The firm's organizational performance is the combined outcome of organizational mechanisms, practices, systems, and behaviours of the employees [11,77]. A firm employee's performance eventually translates into the overall organizational performance. We contend that employees observe their firm's direction, actions, and commitment toward noble causes to benefit society. More specifically, employees who observe that their organization is not just concerned about profit generation and increasing its balance sheet but also are equally mindful of societal concerns; they

perceive and realize such goodwill positively [78]. They also support such initiatives through their behaviours by going out of their way. We posit that when the organizational initiatives are aligned with the EMS framework, employees complement them with the help of their voluntary PEB.

Their voluntary PEB, such as OCBE, results from their intrinsic motivation and commitment. Our notion is that owing to these green organizational initiatives based on the EMS, i.e., ISO14001 standards, they positively impact PEB. These positive, green organizational endeavours are pivotal in arousing their employees' pro-social motivation [23,79]. Pro-socially motivated employees often demonstrate behaviours not mentioned in the job requirements provided in their job description. Such employees also voluntarily help and support their co-workers in demonstrating green behaviours. This set of employees also starts green initiatives independently. The reason is that their PEBs impact all three aspects, e.g., (financial, social, and environmental) of the firm TBL performance. We also ground our discussion in the prior empirical studies conducted by sustainability scholars to develop our theoretical reasoning to support and justify our hypothesis.

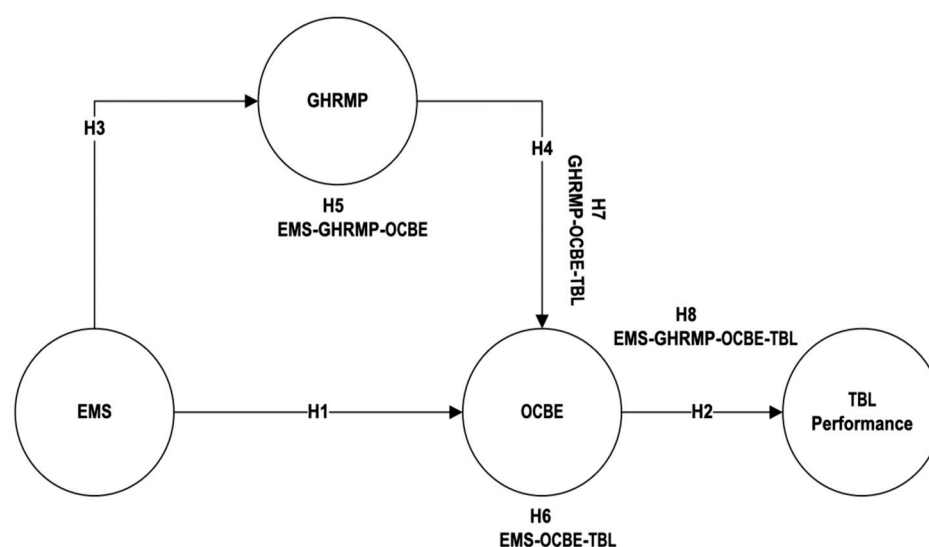
Chang et al. [80] conducted a study in which they found that OCBE mediates the relationship between green organizational identity, shared vision, and green product development performance of the firm. Malaysian researchers [81] confirmed a mediational effect of OCBE on the relationship between green competence-building practices, green motivation, green employee involvement practices, and environmental performance in the Malaysian higher education sector. We summarize our prior discussion and propose hypothesis **H6**: OCBE mediates the relationship between EMS and TBL; **H7**: OCBE mediates the relationship between green HRM practices and TBL; and **H8**: green HRM practices and OCBE serially mediate the relationship between EMS and TBL performance among ISO14001 certified firms.

### 3. Research Model and Theoretical Justification

This research has four primary constructs, for instance: (i) EMS (exogenous variable), (ii) green HRM practices, (iii) OCBE (mediators), and (iv) TBL performance (endogenous variable). These relationships are based on the social exchange theory [82,83] and the ability motivation theory (AMO) [84] which are used as theoretical foundations (see Figure 1). We contend that green HRM practices based on AMO theory can enable and motivate employees to foster their discretionary green behaviours, e.g., OCBE providing them opportunities to invest their time and efforts in green initiatives [70]. By doing so, scholars have confirmed that TBL performance can be elevated if EMS is enacted and provide the necessary support [85–87]. We rely on the previous literature that categorically argued that organizational systems, green HRM practices, and discretionary green behaviours are conducted and work under the social exchange relationship between an employee and the organization [88,89].

Consequently, reciprocity is an important conceptual pivot in a social exchange-based relationship in which the employee reciprocates to the organization through their discretionary behaviours and benefits the organization [83,88]. Apart from this theoretical prism of social exchange, the discretionary behavioural outcomes at an employee level have also been backed by the theoretical justification of the AMO theory, which suggests that the green HRM practices of an organization develop the abilities of an employee through green training and development, inculcates the motivation to perform discretionary green citizenship behaviours, e.g., OCBE and lastly provides them with adequate opportunities to enact such voluntary citizenship behaviours aimed at benefitting the environment [90,91].





**Figure 1.** Research model. Environmental management system (EMS), green HRM practices (GHRMP), organizational citizenship behaviour for the environment (OCBE), triple bottom line (TBL).

Similarly, the AMO theory describes how green HRM practices positively impact people's work behaviours, resulting in corporate success [92]. In this study model, the AMO framework is used to inspire employees through green HRM practices and give them opportunities to engage in green voluntary behaviours, e.g., (OCBE), which improves and elevates firm TBL performance. The current study model explains how EMS can improve TBL performance using PEB, e.g., (OCBE) and green HRM practices as serial mediators.

### 3.1. Research Methods

The research method provides a plan for a problem under investigation. According to Bogdan and Biklen [93], a positivist research paradigm refers to philosophical assumptions and underlying propositions that govern a research study [94]. These underpinning propositions navigate the process of how research should be conducted. Therefore, it becomes essential for researchers to choose a research design and paradigm [95]. Current research uses a quantitative research design based on a positivist paradigm by testing proposed hypotheses to validate measurement and structural models, corroborate existing theories, and justify research findings. This study employed a quantitative research design that uses a deductive approach. This research study examines the relationship among model variables, e.g., EMS, green HRM practices, OCBE and TBL performance [96]. According to Sekaran and Bougie [97], a deductive approach is more appropriate for this type of research. Consequently, the researcher developed a testable research hypothesis based on reviewed literature.

### 3.2. Target Population, Sample Size, and Data Collection

According to the existing data based on the FMM directory total of 492 manufacturers were ISO14001-certified in the standard archived category. Most manufacturers are in the central region, i.e., Kuala Lumpur, Selangor, and the southern region, mainly in Johor and Malacca. Therefore, the current study required a minimum sample size of 216 respondents based on Krejcie and Morgan [98] and the statistical formula. Random sampling is more appropriate, where each outcome is provided with an equal chance of selection and enhances the generalizability of the results.

Therefore, the current study targeted a minimum sample size of 216 respondent firms can also be calculated via the formula  $n = N * [Z^2 * p * (1 - p) / e^2] / [N - 1 + (Z^2 * p * (1 - p) / e^2)]$ . The required sample size was 216 at a 95% confidence level and a 5% margin of error [99]. Moreover, the outcome of EMS, green HRM practices, OCBE, and TBL was evaluated at the organizational level.

Response rate is a key consideration in quantitative research. A higher response rate produces quality data with validity and generalizability, whereas a low response rate makes data with questionable quality [100]. Some methodological experts believe that more than a 50% response rate is sufficient [101]. Considering the methodological benefits of a reasonable response rate, we aimed for a large sample to circumvent the issue of a low response rate. Simple random probability sampling was used for choosing three hundred and fifty (350) manufacturing firms in Malaysian via survey questionnaires. All of them were duly ISO14001 certified. We received back two hundred and forty-eight (248) questionnaires from them. This amounted to a response rate of 70%. Although after removing outliers, missing and incomplete data, and clean data of two hundred and sixteen (216), that was sufficient for the SEM technique.

### 3.3. Survey Measures

Questionnaires are considered valuable research tools for data collection and were utilized for performing the study with four latent variables, e.g., EMS, green HRM practices, OCBE, and TBL. For measuring EMS, the present study used the 06- items scale based on a 5-point Likert scale developed by Prajogo et al. [102]. A sample was “To build synergies among management systems”. Green RHM practices were measured with 12 items based on the 5-point Likert scale adopted from Jabbour [103]. A sample item was “Environmental training is a priority”. The research measured OCBE with 12 items based on a 5-point Likert scale developed by Boiral and Paillé [41]. A sample item was “I stay informed of my company’s environmental initiatives”. This study measured TBL based on three dimensions, including environmental, social, and economic, using a 13-item scale adapted from Maletič et al. [104]. A sample was “The percentage of recycled materials has increased during the last three years”.

## 4. Data Analysis and Results

Based on descriptive statistics overall, nine (09) organizations operating in the manufacturing sector participated in this reported research study. Descriptive statistics analysis results revealed that major industrial groups in the sample were food, beverages, and tobacco (23%), electrical and electronics (19%), chemicals including petroleum (15%), and fabricated metals (10%). However, the rest of the industrial groups were less than 10%, including machinery (9%), plastic (6%), transport (8%), rubber (7%), and others (3%). Based on number of employees, participant firms were categorized into (i) large, (ii) medium and (iii) small size. Large firms, e.g., 501–1000, was around 27%, followed by medium 101–250, 24%; the rest were small firms, accounting for, less than 20% in the study. The last characteristic of firms was the year of establishment, e.g., the highest among all was 1991–2000, accounting for 32%, followed by 2001–2009, i.e., 25%, and the rest were less than 20%.

### 4.1. Measurement Model

The structural equation model (SEM) analysis comprises two stages: (i) the measurement model and the structural model. To assess the measurement model, two key parameters need to be fulfilled. (1) convergent validity (CV) and (2) discriminant validity (DV). To assess CV further, three criteria were used: (i) item loading should be 0.7 and above for each construct; (ii) composite reliability (CR) should be 0.70 or greater; (iii) the average variance extracted (AVE) should be 0.50 or more. In the output of the measurement model, as highlighted in Figure 2, all three criteria were met, and the values of each item loading, CR, and AVE were reported accordingly.

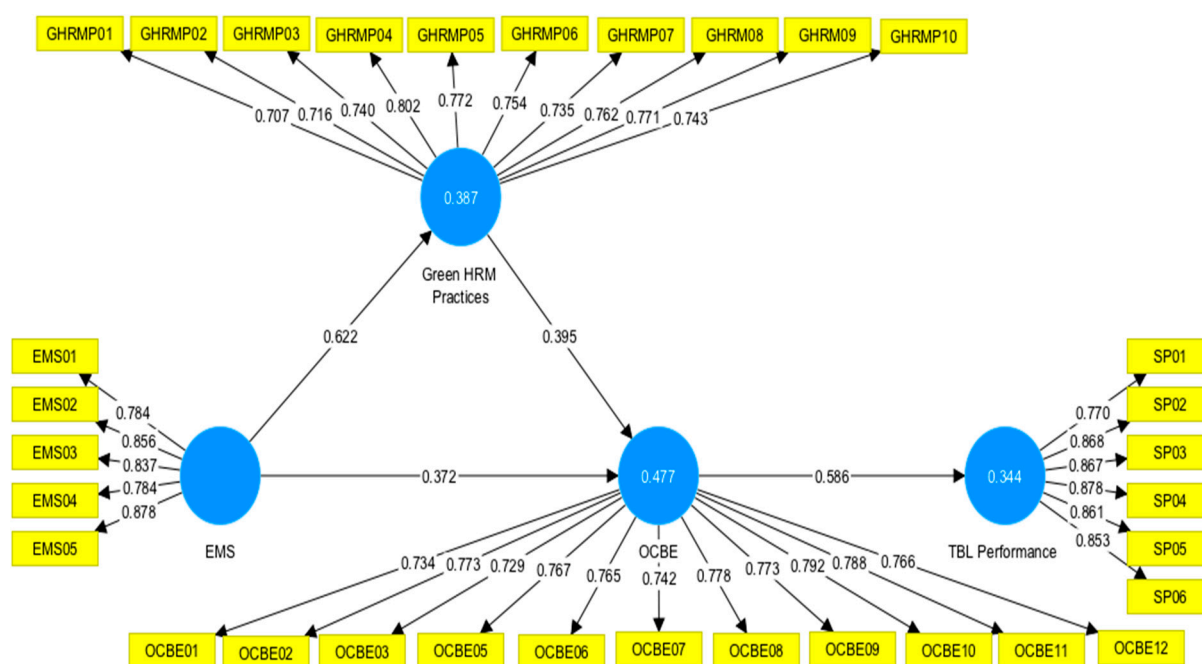


Figure 2. Adjusted measurement model.

To assess the measurement model further, (2) discriminant validity (DV) needs to be validated. Additionally, three criteria are used to validate DV: (i) Fornell–Larcker criterion; (ii) cross-loadings; and (iii) Heterotrait–Monotrait Ratio (HTMT). For example, to validate DV based on the Fornell–Larcker criterion, the diagonal value for each variable, such as the green HRM practices diagonal value of 0.751, must be greater than the correlation value of 0.622 in front and 0.627 below. For detailed values, see Table A1, Table A2, Table A3, and Table A4, respectively, in Appendix A. The cross-loading of each item for the individual construct should load higher than other constructs in the row, e.g., EMS items 01 loading is 0.784, whereas lower on green HRM practices, i.e., 0.453. the details of items loading are highlighted in Table A3. Lastly, (iii) the HTMT ratio is also used for validating DV. Each construct inter-correlation value should not exceed 0.90, as shown in Table A4. Therefore, all three parameters of validating DV were fulfilled accordingly. The next step of SEM is to proceed with the structural model assessment.

#### 4.2. Collinearity Assessment

Before assessing the structural model, it is important to perform a collinearity assessment. After confirming the collinearity assessment, the next step was to analyse direct and indirect effects using a structural model. The variance inflation factor (VIF) values were calculated to inspect multicollinearity via Smart PLS 4.0. The threshold for VIF for all the values for each endogenous construct should be less than 5. The conservative level for VIF is to be less than 2.5. For example, the VIF value for OCBE is 1.632. The result confirms that no collinearity issue existed in the model. Details of the results are shown in Table 1.

Table 1. VIF values.

	EMS	Green HRM Practices	OCBE	TBL Performance
EMS	-	1.000	1.632	-
Green HRM Practices	-	-	1.631	-
OCBE	-	-	-	1.000
TBL Performance	-	-	-	-

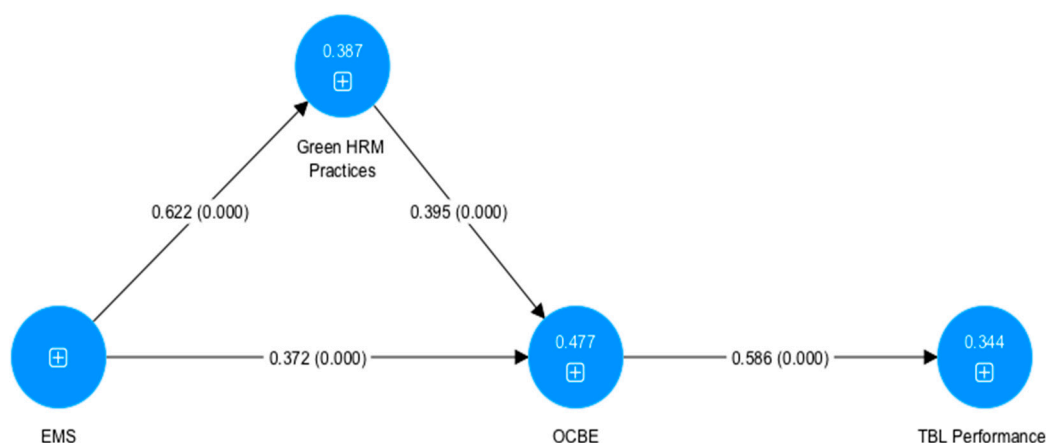
#### 4.3. Structural Model

The second step SEM was to assess through a structural model. The structural model was performed using the complete bootstrapping option in Smart PLS 4.0. To ensure the stability of results, the bootstrap sub-sample with, e.g., 5000 iterations was used. The final output includes path coefficients, indirect effects, total effects, coefficient of determination ( $R^2$ ), and effect size ( $f^2$ ), which were calculated.

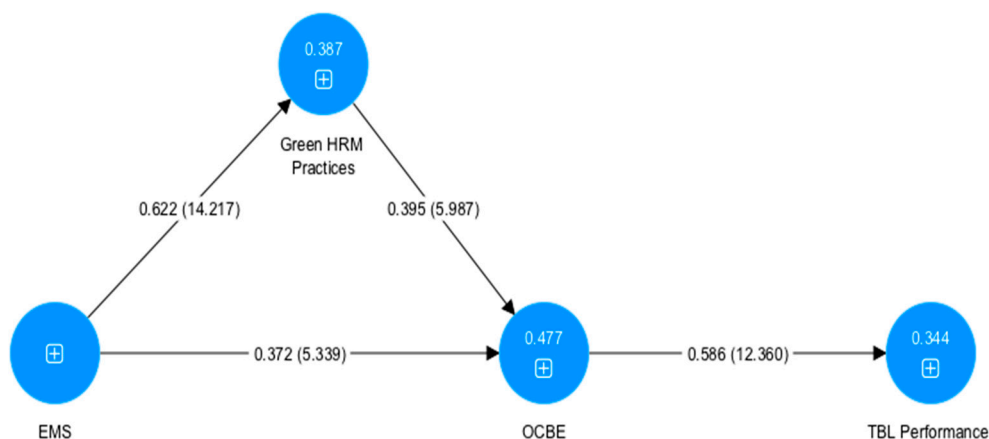
According to the structural model output, all direct hypotheses H1–H4 were supported. The threshold for three parameters, e.g., coefficient of correlation beta value should be between 0.01 to 0.9, critical value (T statistics) should be greater than (1.96), and P value less than (0.05). Accordingly, all the values fall within the given limit. The summarized output is shown in Table 2 and Figures 3 and 4.

**Table 2.** Direct effects.

S. No	Hypotheses	Original Sample (O)	T Statistics ( O/STDEV )	P Values	Result
H1	EMS → OCBE	0.372	5.339	0.000	Supported
H2	OCBE → TBL Performance	0.586	12.360	0.000	Supported
H3	EMS → Green HRM Practices	0.622	14.217	0.000	Supported
H4	Green HRM Practices → OCBE	0.395	5.987	0.000	Supported



**Figure 3.** Structural model with path and P values.



**Figure 4.** Structural model with path and T values.

According to the structural model output, all indirect hypotheses H5–H8 were supported using beta value, T statistics, and P values as key parameters. For example, the four mediation paths, including serial mediation path H8 (EMS- > GHRMP- > OCBE- > TBL), also supported the summarized output shown in Table 3.

**Table 3.** Structural model serial mediations.

S.NO	Hypotheses	Original Sample (O)	T Statistics ( O/STDEV )	P Values	Result
H5	EMS → GHRMP → OCBE	0.246	5.415	0.000	Supported
H6	EMS → OCBE → TBL	0.218	4.335	0.000	Supported
H7	GHRMP → OCBE → TBL	0.232	5.150	0.000	Supported
H8	EMS → GHRMP → OCBE → TBL	0.144	4.603	0.000	Supported

#### 4.4. The Explanatory Power of the Model ( $R^2$ ) and Effect Size ( $f^2$ )

The  $R^2$  value explains how many endogenous variables, e.g., (green HRM practices, OCBE, and TBL) are explained by exogenous variables in the current model. The  $R^2$  value for the green HRM practices was 0.387, implying that 38% explain by EMS as an exogenous variable. The details of other variables, e.g., OCBE, and TBL, are given in Table 4.

**Table 4.** Explanatory power of the model  $R^2$ .

Endogenous Variable	$R^2$ Values	Threshold
Green HRM practices	0.387	$\geq 0.33$ (moderate)
OCBE	0.477	$\geq 0.33$ (moderate)
TBL Performance	0.344	$\geq 0.33$ (moderate)

Furthermore, this study's effect size ( $f^2$ ) determines if the missing construct substantially impacts the endogenous components. According to Cohen [105], the size effect can be categorized as small (0.02–0.14), moderate (0.15–0.34), and large (greater than 0.35). Table 5 shows the values with  $f^2$  for each path in the current model. The effect size varies from moderate, e.g., 0.162 for EMS → OCBE, to large, e.g., 0.632 for EMS → Green HRM practices.

**Table 5.** Result for effect size ( $f^2$ ).

Paths	Effect	Effect Size
EMS → Green HRM Practices	0.632	Large
EMS → OCBE	0.162	Moderate
Green HRM Practices → OCBE	0.183	Moderate
OCBE → TBL Performance	0.524	Large

The importance–performance matrix analysis (IPMA) assessed the performance matrix for the endogenous variable (TBL) and how all exogenous variables, e.g., EMS, green HRM practices, and OCBE primarily contribute to TBL. The values were calculated using PLS-SEM IPMA. For example, the value of OCBE (63.534) is the highest of all. E.g., the values for EMS (63.207) and green HRM practices (53.890) are highlighted in Figure 5.



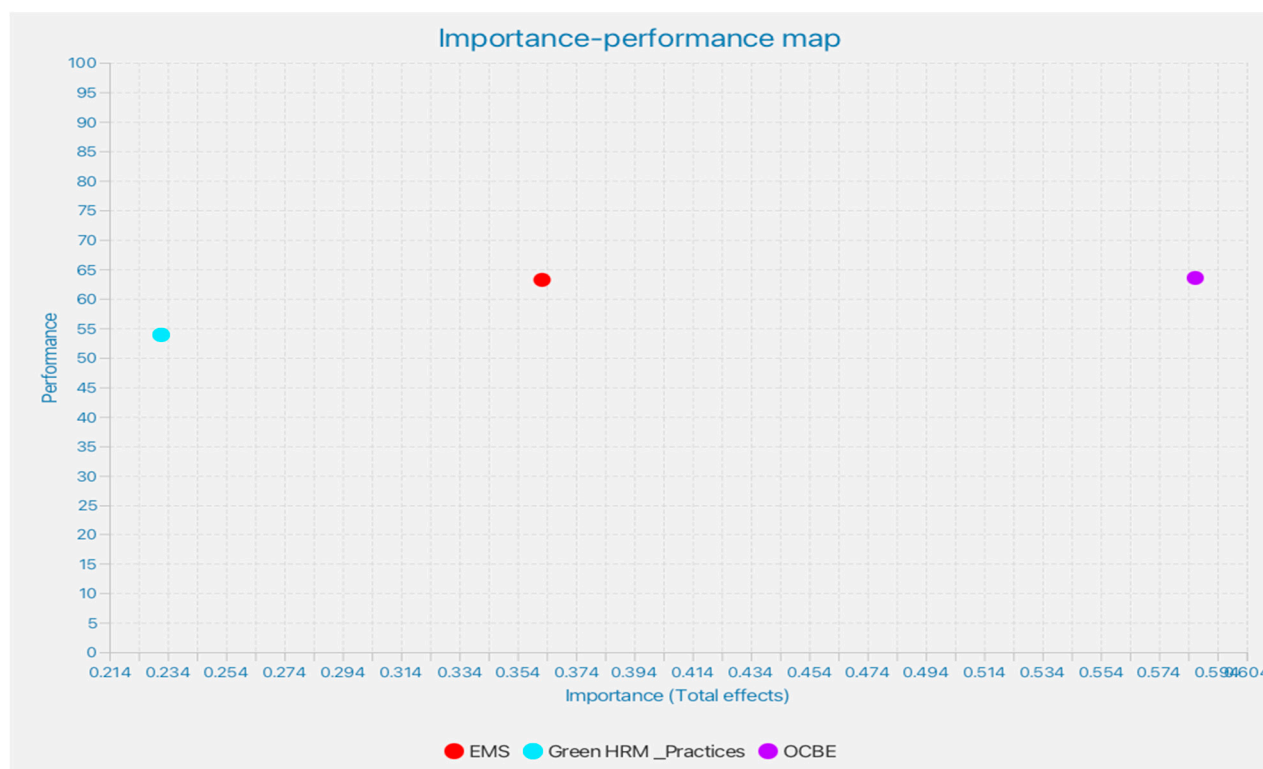


Figure 5. Importance–performance Map.

## 5. Research Discussion and Theoretical Implications

The current study has five key objectives: (i) to investigate the relationship between EMS and OCBE in predicting TBL and proposed hypotheses H1 and H2; (ii) to investigate the relationship between EMS and green HRM practices predicting OCBE and proposed H3 and H4; (iii) to test the serial mediating role of green HRM practices and OCBE on the relationship between EMS and TBL among ISO14001-certified manufacturing firms; and proposed hypotheses H5, H6, H7, and H8. To achieve objective (i) H1, EMS is positively related with OCBE, H2; OCBE is positively associated with TBL performance also supported. Similarly, for objective (ii) H3, EMS is positively correlated with green HRM practices, and in H4, green HRM practices positively related to OCBE are supported. Further, to meet objective (iii), H5, green HRM practices mediated the relationship between EMS and OCBE; H6-OCBE mediated the relationship between EMS and TBL; H7-OCBE mediated the relationship between green HRM practices and TBL; and H8 green HRM practices and OCBE that serially mediated the relationship between EMS and TBL were supported accordingly. All the findings of this study are aligned with previous studies.

Indeed, green HRM practices are driven by shared PEB values. For example, companies can make their employees perform voluntary PEB, such as OCBE, through green HRM [106]. This ultimately can lead to developing a green organizational culture, which in turn encourages the promotion of low-carbon utilization on the part of employees. Moreover, employee PEB can foster green HRM practices [107]. Research revealed that around 85% of the PEBs performed by employees at work are voluntary in nature, meaning that they are not rewarded by the firm's performance-measuring mechanisms. Employees differ in their understanding and conduct in performing PEB; older employees are shown to be more involved in conserving practices than younger employees [108].

It is known that the impact of a variety of green HRM practices on employee PEB at work and home is limited, as reported in the academic literature. Past research has also emphasized conducting green training to make the workers internalize EMS ISO 14001 [109]. This training is considered an essential source of sustainability in organizations where OCBE is taken as voluntary PEB that employees opt for it on their own without

an organizational compulsion. We argue that all the PEBs consisted of three dimensions, namely eco-helping behaviour, eco-initiatives behaviour, and eco-civic engagement, which can improve firm TBL performance, including social, economic, and environmental. We submit that when an employee engages in eco-helping by coming to the aid of co-workers, it will result in better PEB on the part of their co-workers, whose green behaviour, in turn, will lead to the TBL performance of the firm. However, as we know, training resources and environmental commitment are helpful in elevating TBL. However, in some cases, firms avoid such costly efforts, resulting in a less skilful approach towards dealing with sustainable performance [110].

Similarly, managers in the Malaysian manufacturing sector struggle to successfully implement EMS ISO14001 due to a scarcity of resources, e.g., a lack of training programs [111]. Besides the absence of training opportunities at the workers' disposal, numerous other critical factors for adopting EMS ISO14001 have been noted by scholars, including documentation-related requirements and social barriers [112]. Thus, owing to the reasons behind low ISO14001 certification in Malaysian manufacturing firms, these are justified. This fact becomes further evident once we consider the facts and figures in the FMM 52nd edition directory. Only 492 manufacturing firms are certified out of 2561. This situation can be improved through various steps, such as allocating green rewards to serve as a channel for fostering the adoption of ISO14001 and employees' OCBE [113].

Furthermore, putting together green teams can also be helpful in this regard, apart from developing programs that encourage eco-champions of green organizational values at a strategic level. The findings of our research confirmed that Malaysian manufacturing firms need a sense of urgency from all relevant stakeholders to foster efficient as well as effective adoption of ISO14001 and implement green HRM practices. Based on our study result, we strongly recommend firms should support and encourage their employees to perform and engage in voluntary PEB such as OCBE. We believe that by doing so, they can gain an added benefit through a significant increase in TBL performance. Besides, this will also bridge the widening gap between TBL's economic and environmental components [111,114]. Encouragement by supportive managers is also crucial in making these environmental initiatives successful [115].

The same is the case for seeking greater employee support and participation for the enhancement of the sustainable performance of the firm. Green HRM practices hold the potential to play the facilitating role for employees showing a willingness to own the green initiatives of their employer. Notably, green appraisal practice is most important. Pro-environmental organizational climate is also a primary source of social influence that compels employees to behave in line with corporate expectations regarding sustainability initiatives. This motivates employees to fulfil their job description-related duties and responsibilities and to volunteer for organizational and ecological benefits. As evidenced in the previous literature, apart from tangible drivers of employee behavioural outcomes such as rewards and punishment mechanisms, the intangible psychological drivers also likely hold the potential to drive the behaviour of the employees [116,117]. Environmental issues are at the centre stage of every debate by policymakers. Firms, vital stakeholders, are also becoming cautious of the possible impact of their business activities on the environment. As a result, firms are now more proactive in managing and mitigating the environmental hazards of their operations [118]. To get a competitive advantage in pro-environmental activities, firms must ensure the implementation of EMS in the first place.

Moreover, the EMS can manage the firm's environmental, social, and economic performance. The EMS framework is beneficial for manufacturing firms in terms of guiding them to improve TBL performance. It has been proven to be the catalyst for reducing the harmful impact of manufacturing activities on the environment [119].

### *5.1. Practical Organizational and Managerial Implications*

Research confirmed that managers who make decisions based on EMS guidelines and consider stakeholders' environmental concerns could lead to satisfactory TBL performance.

Moreover, senior managers also use the EMS to set benchmarks for conducting periodic environmental assessments. Taking directions related to the EMS from the top management, the middle managers customize, contextualize, and streamline the organizational green HRM practices aligning with EMS implementation. The middle managers should shift their focus toward sustainability to meet environmental objectives. To balance three elements of TBL performance, e.g., financial, social, and environmental, it is essential to adopt green HRM practices and align them with the EMS framework irrespective of their size and scope. In order to desire results, firms need to allocate sufficient resources for the implementation of EMS. This framework provides managers with a signpost to cut down environment-related costs that can consequently improve business performance. Scholars and policy-makers have confirmed that the corporate environmental performance of the firms who opt for the EMS ISO14001 certification can better manage the organization's overall sustainability performance. It has also become evident that alongside pro-environmental initiatives, e.g., EMS adoption, other factors such as environmental and eco-behaviours are equally crucial for achieving TBL performance.

More importantly, environmental initiatives can be developed through the managerial emphasis and concern for these specific policies. For instance, when a boss shows concern about the implementation of pro-environmental policies and procedures, he/she can be supportive towards their subordinates for fostering sustainability-related actions and a pro-environmental organizational climate [116,120]. In line with Zientara and Zamojska [117], we further posit that an investment in sustainability-oriented policies can shape normative pro-environment initiatives that result in high esteem for the organization. Thus, it can be reasoned that a pro-environmental organizational climate is an important linkage that aligns the organizational aspiration for becoming more sustainable with the green behaviour of employees. Apart from that, Ones and Dilchert [6] mentioned that a pro-environmental organizational climate could substitute the missing perspective of employees from sustainability reporting.

## 5.2. Research Limitations and Future Recommendations

This study also has some important limitations. For instance, cross-sectional data cannot be used for future forecasting. This study used TBL performance as a reflective measure, although other researchers used it as a formative construct. Quantitative studies cannot explain the context and element of subjectivity, unlike qualitative research, as behavioural research is more subjective in nature. Moreover, the relatively small sample size is also a matter of great concern regarding the generalizability of results to other industries. However, future research can use other antecedents and predictors to assess TBL performances using company background as moderator and TBL as formative measures. Finally, this research study examined EMS, green HRM practices, and OCBE as antecedents of TBL performance.

Future research may investigate the potential role of sustainability and digital business models in creating pathways toward sustainable development and circular economy performance. Future research can also investigate relevant antecedents and mediators or contextual moderating variables to explain TBL performance with a large sample using mixed-method approaches. This research also presents important recommendations for managers and their companies. The findings of the current study are aligned with the environmental performance index (EPI) and national environmental policy (NEP). The EMS adoption is vital, and the ISO14001 certification level can be improved by making it mandatory for Malaysian manufacturers to maintain adequate environmental compliance. The findings of this study have policy recommendations for the national development policy (NDP) and the national vision policy (NVP). This research recommends policymakers implement green policies and initiatives to protect the environment from industrial waste and pollution.

Moreover, it would be helpful to mitigate these hazards' negative impacts on society and the natural environment. The current study encourages investment in green HRM and environmental initiatives where manufacturing industries need to adopt EMS initiatives to enhance organizational and industrial production to achieve sustainability at the micro-level, i.e., industry, and macro-level. It would also ensure economic growth. Item number three (03) of MIDA's "Malaysia's national environmental policy" emphasizes "Ensuring continuous improvement in the productivity and quality of the investment environment while pursuing economic growth and human development."

## 6. Conclusions

In recent years, several scholars have contributed to the concept of green HRM and EMS initiatives. Both contemporary concepts have emerged as key strategic areas of concern for manufacturing organizations. Integrating green HRM practices and EMS initiatives is a prerequisite for enhancing green abilities, employees' commitment, and motivation towards environmental initiatives to achieve TBL performance. The manufacturing organizations face tremendous pressure from respective stakeholders such as governments, businesses, and the increasing awareness of the consumers about environmental issues to adopt green HRM practices and EMS initiatives. Mostly small manufacturing firms, SMEs, and other large manufacturing industries face various difficulties and barriers to adopting green initiatives in Malaysia.

Manufacturing organizations play a critical role in the country's economic growth. However, this comes with the cost of environmental issues. Likewise, sustainability is equally essential for Malaysian manufacturers to achieve TBL performance. Organizations should try to achieve balanced economic, ecological, and social outcomes. Manufacturing firms should implement green HRM practices to achieve TBL performance, adopt EMS ISO14001, and encourage OCBE to enhance TBL performance. Consequently, environmental managers become proactive proponents of greening their organization's climate. To achieve the goals of sustainable development it is essential to study the integration of digital technology into green innovation and production processes to improve the performance of digital green innovation and the competitiveness of enterprises. To help manufacturing enterprises, we must find external partners to improve their digital green innovation performance through external knowledge search partner selection. This study has practical value for enterprises to improve competitiveness, survival, and development in the current environment [121].

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## Appendix A

**Table A1.** Convergent validity.

Construct	Items	Factor Loading	CR	AVE
EMS	EMS01	0.784	0.916	0.687
	EMS02	0.856		
	EMS03	0.837		
	EMS04	0.784		
	EMS05	0.878		
Green HRM Practices	GHRMP01	0.707	0.928	0.564
	GHRMP02	0.716		
	GHRMP03	0.740		
	GHRMP04	0.802		
	GHRMP05	0.772		
	GHRMP06	0.754		
	GHRMP07	0.735		
	GHRMP08	0.762		
	GHRMP09	0.771		
	GHRMP10	0.743		
OCBE	OCBE01	0.734	0.939	0.584
	OCBE02	0.773		
	OCBE03	0.729		
	OCBE05	0.767		
	OCBE06	0.765		
	OCBE07	0.742		
	OCBE08	0.778		
	OCBE09	0.773		
	OCBE10	0.792		
	OCBE11	0.788		
	OCBE12	0.766		
TBL	TBL01	0.770	0.940	0.723
	TBL02	0.868		
	TBL03	0.867		
	TBL04	0.878		
	TBL05	0.861		
	TBL06	0.853		

**Table A2.** Fornell–Larcker criterion.

	EMS	GHRMP	OCBE	TBL
EMS	0.829			
GHRMP	0.622	0.751		
OCBE	0.618	0.627	0.765	
TBL	0.794	0.672	0.586	0.850



**Table A3.** Cross loadings.

	EMS	Green HRM Practices	OCBE	TBL Performance
EMS01	0.784	0.453	0.483	0.587
EMS02	0.856	0.514	0.544	0.739
EMS03	0.837	0.535	0.602	0.629
EMS04	0.784	0.539	0.394	0.683
EMS05	0.878	0.535	0.518	0.655
GHRMP01	0.431	0.707	0.470	0.436
GHRMP02	0.458	0.716	0.467	0.539
GHRMP03	0.380	0.740	0.456	0.435
GHRMP04	0.434	0.802	0.434	0.525
GHRMP05	0.502	0.772	0.445	0.564
GHRMP06	0.463	0.754	0.454	0.478
GHRMP07	0.457	0.735	0.420	0.459
GHRMP08	0.502	0.762	0.485	0.515
GHRMP09	0.534	0.771	0.557	0.555
GHRMP10	0.484	0.743	0.491	0.517
OCBE01	0.511	0.453	0.734	0.477
OCBE02	0.413	0.444	0.773	0.396
OCBE03	0.437	0.472	0.729	0.410
OCBE05	0.518	0.495	0.767	0.530
OCBE06	0.477	0.434	0.765	0.454
OCBE07	0.430	0.393	0.742	0.391
OCBE08	0.440	0.507	0.778	0.423
OCBE09	0.452	0.446	0.773	0.384
OCBE10	0.418	0.490	0.792	0.409
OCBE11	0.530	0.519	0.788	0.497
OCBE12	0.529	0.578	0.766	0.512
SP01	0.601	0.534	0.453	0.770
SP02	0.681	0.575	0.467	0.868
SP03	0.666	0.610	0.512	0.867
SP04	0.702	0.595	0.542	0.878
SP05	0.685	0.562	0.489	0.861
SP06	0.711	0.550	0.519	0.853

**Table A4.** Heterotrait-Monotrait Ratio (HTMT).

	EMS	GHRMP	OCBE	TBL
EMS				
GHRMP	0.688			
OCBE	0.671	0.672		
TBL	0.879	0.729	0.626	

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