**Abstract**

**Purpose –** This study aims to develop and test a theoretical model that empirically examines how green organizational culture affects organizational performance. More significantly, it investigated and empirically explored the study model's mediation of environmental performance and green innovation, which had previously received little attention.

**Design/methodology/approach –** For the sample size of 170 respondents, a quantitative approach was used. Convenient random sampling was utilized to get data from the respondents. Data was gathered from industrial and service organizations in four Malaysian states via a field survey utilizing a closed-ended questionnaire. The partial least square analysis technique was used to conduct the analysis, which used the structural equation model.

**Findings –** Green organizational culture was shown to be a significant predictor of green performance in this research. Furthermore, the findings reveal that environmental performance and green innovation fully mediate the relationship between green organizational culture and organizational performance.

**Research limitations/implications –** There are several limitations to this study that lead to future research directions. The study's most significant drawback is that the data comes from a Malaysian setting, which may make generalization difficult. The fact that this research is based on cross-sectional data further limits it.

**Originality/value –** By addressing organizational performance, which has not been empirically examined, this research adds to the current literature on green organizational culture, environmental performance, and green innovation. This research also presents a novel theoretical explanation for the relationships by understanding the mediating role of environmental performance and green innovation.

**Keywords:** Green organizational culture, environmental performance, Green innovation, Organizational performance, Malaysian manufacturing firms

**Paper type:** Research paper

**Introduction**

Organizations increasingly incorporate sustainability into their plans and activities as public awareness and concern about increasing environmental sustainability grow (Ikram et al., 2019). As decision-makers confront rising public sensitivity, tighter environmental laws, and increasing shareholder pressure to protect the natural environment, performance problems become more relevant to organizations (Wang, 2019). However, today's industrialists, environmental policymakers, corporate executives, and academics all concur that environmental deterioration has an impact on organizational performance (Kraus, Rehman, & García, 2020). Many scholars have investigated the development of managerial skills and attributes that enhance organizational effectiveness, including economic and environmental performance (Dzhengiz, & Niesten, 2020). Furthermore, according to many pieces of research, changes in public expectations drive businesses to enhance their competitive edge in order to retain and improve their economic survival. Organizations are increasingly under pressure to develop and execute innovative and long-term solutions both inside their own walls and throughout their supply chain networks Neutzling et al., (2018). Organizations must focus on environmental and nature conservation activities due to different performance problems that have been identified. In recent decades, industrial practitioners and academics have been motivated by a desire to pay attention to "green" problems (Vallaster et al., 2019). Researchers progressively shift their focus from general discussion to constructs such as green HRM practices (Chakraborty, & Biswas, 2020), green supply chain management practices (Tan et al., 2016), green supply chain performance 2018), green bonding (Li & Huang, (2017), and green innovation (Song, & Yu, 2018; Takalo, & Tooranloo, 2021). Because of the competitive climate, business patterns have evolved quickly all over the globe. It is not enough to make a profit and acquire a competitive edge; you must also be responsible for the environmental consequences. As a result, the present research focuses on what factors are used to assess organizational performance. The significance of technical difficulties increases in direct proportion to an organization's green innovation implementation. Green standards of practice, on the other hand, are usually adopted only when businesses think they would benefit financially and offer them a competitive edge (García-Machado, & Martínez-Ávila, 2019). Environmental stewardship is becoming more important inside businesses, and it has become an integral element of their strategy and perspective (Wang, & Juo, 2021). According to Huang & Li (2017), Green initiatives may help organizations achieve better outcomes by lowering manufacturing costs and increasing economic efficiency (Ghisellini et al., 2016). As a result, environmental efforts are often seen as critical to long-term performance Ainin et al., (2016). It's conceivable that embracing and implementing a green culture may result in better organizational performance. In recent years, there has been little empirical evidence that green innovation and organizational performance provide a competitive advantage to businesses (El-Kassar & Singh 2019). Green organizational culture has received a lot of attention from researchers, and it is regarded as a significant phenomenon (Yang et al., 2017). Green organizational culture is well-recognized throughout the globe, according to the literature, and it is currently highly influential and essential for businesses due to the increased emphasis on performance (Roscoe et al., 2019). Traditionally, businesses have focused on profit, but times are changing, and businesses should focus on the Environment (Bennett & James 2017). Researchers have looked at performance through the lens of a green organizational culture (Chandra et al., 2021). Furthermore, a few studies have shown that having a green organizational culture improves organizational performance considerably (Wang, 2019). Although various studies have linked green organizational culture to a firm's success, researchers continue to concentrate on this connection due to the lack of definitive findings. According to the literature, there is no clear link between green organizational culture and organizational performance. Furthermore, several researchers supported the use of moderators or mediators between green organizational culture and organizational performance, notwithstanding the findings of previous studies (Gürlek and Tuna 2018; Chandra, 2021). As a result, our study adds two mediators between green organizational culture and organizational performance: environmental performance and green innovation. El-Kassar and Singh (2019), Leal-Rodrguez et al. (2018), Nishant et al. (2012) believe green innovation and environmental performance to be major predictors of organizational success. Furthermore, research has shown that green innovation is critical to attaining long-term success (Awan et al., 2019; Sobaih et al., 2020). When it came to measuring environmental performance, the researchers gave little attention to green innovation. Green innovation and environmental performance are used in this research to evaluate organizational performance. Despite this, the environmental performance has received little attention from studies when determining environmental performance. This study aims because, given the mediating function of environmental performance and green innovation, academics have paid less attention to green organizational culture in determining organizational performance in major manufacturing companies in Malaysia. Thus, the primary objective of this research is to look into the relationship between green organizational culture and organizational performance, while the secondary objective is to see if environmental performance and green innovation play a role in mediating the relationship between green organizational culture and organizational performance. The study's third objective is to look at the link between environmental performance, green innovation, and organizational performance.

**Literature review and hypotheses development**

**Green Organizational Culture**

In the area of sustainability, green organizational culture is a relatively undeveloped study topic. As a result, its definition is rather ambiguous. Some researchers (Küçükoğlu & Pınar, 2016; Gürlek & Tuna, 2018) argue that the concept of green organizational culture may be readily modified and inferred from prior organizational culture literature. The values, beliefs, ethos, and shared mental assumptions that guide members of an organization about the propriety of their actions and behaviour in different circumstances are referred to as organizational culture (Schein, 1992). Green organizational culture may be described as the values, principles, and beliefs that govern an organization's conduct and activities concerning the natural environment. It expresses an organization's unshakable desire or responsibility to remain dedicated to environmental problems. Pro-environmental culture, sustainability culture, green awareness, and eco-friendly culture are other names for green organizational culture. When organizational members think and act beyond economic motivations to maximize the beneficial effect of organizational operations while limiting detrimental operational actions on the natural environment, they are said to have a "green" culture (Roscoe et al., 2019). Organizations with a green culture are more likely to evaluate and create different ways to address performance issues. Performance improvement methods are included into the purpose and vision of such organizations. A strong green culture puts pressure on manufacturers to adhere to business principles and encourages them to do so. As a result, green culture tends to influence organizational members' behaviour by the organization's objectives and ethos (Chang & Lin, 2015).

**Environmental Performance**

Choosing a relevant performance metric is getting more difficult, but it is becoming essential among business practitioners and academics. The researchers focused on environmental performance in this study. The researchers were interested in determining the environmental effects of manufacturing companies' activities, particularly when the green organizational culture was implemented. Manufacturers may evaluate their efforts, initiatives, and improvements in the natural environment using a comprehensive measure of performance from an environmental standpoint. As defined by Dubey, et al., (2015) and Rawashdeh (2018), environmental performance is a connection between an organization's activities and the environment. It examines companies' capacity to reduce or eliminate hazardous gas emissions, such as carbon dioxide, resulting from operational activities throughout a supply chain network. While this explanation is correct, it only addresses one of the most important elements of evaluating environmental performance: decreased harmful emissions. As a result, many studies (Feng et al., 2018; Anthony, 2019; Chen, 2015; Esfahbodi et al., (2016) have holistically conceived and evaluated environmental performance. These previous studies evaluated an organization's environmental performance based on its ability to reduce waste, reduce carbon dioxide emissions, reduce energy consumption during production, reduce toxic material consumption, conduct frequent environmental audits, and reduce the overall environmental impact of operational activities.

**Green Innovation**

Different businesses are opting to embrace ecological practices in business due to the global concern for the environment. Unfortunately, in developing nations, this is not the case. Nonetheless, businesses must embrace this strategy since it allows them to protect the environment and decrease pollution (Alhadid, & As' ad, 2014; Ifrim et al., 2018; Küçükoğlu, 2018). Green innovation may be used for energy-saving product design, processes, and technology, as well as procedures that influence energy efficiency. Consequently, green innovation has evolved into a strategic instrument for attaining the industry's long-term sustainability and improving the Environment (Chang, 2011; Chiou et al. l., 2011). Since the industrial revolution, environmental damage has been with us, but it has grown much more severe and larger scale. It is regarded as one of the world's most pressing issues, and although remedial greener policies have been adopted in recent years, even more, preventive efforts are required (Chen, 2008; Dangelico & Pujari, 2010).

**Organizational Performance**

Organizational performance can be used to evaluate the success of a business's strategic initiatives. Organizational performance, which includes efficiency and effectiveness, according to Szilagyi (1981), is the outcome of organizational actions. The differences between organizational goals and actual outcomes can be explained using organizational performance (Chan et al., 2012). Organizational performance refers to both financial and non-financial performance as it pertains to the performance of an organization for this research. Firms must make tough decisions if they want to thrive in today's changing climate and fierce competition. During a downturn in the economy, survival becomes increasingly difficult. According to research, addressing sustainability problems such as adopting a green organizational culture is essential to a business's long-term survival (Cherchem, 2017). According to Venkartraman and Ramanujam (1986), organizational performance can be measured in three ways: financial performance, operational performance, and organizational effectiveness. Financial performance can be measured by looking at ROI, sales growth, and profitability; operational performance can be measured by looking at market share, new product introduction, and market success rate; and organizational effectiveness can be measured by looking at employee satisfaction and company morale. Because focusing solely on financial indicators leads to an overemphasis on an organization's internal performance while neglecting external environmental performance (Eccles & Pyburn, 1992), Kaplan and Norton (1996) proposed the balanced scorecard method to improve traditional organizational performance measurements.

**Green Organizational Culture and Organizational Performance**

Organizational performance offers important environmental impact information, compliance with regulations and organizational systems (Wijethilake et al., 2018; Wong, 2013; Bassey et al., 2013), representing the efficacy and efficiency of the environmental activities of the organization's (Henri & Journeault, 2008). Organizational performance refers to measuring the relationship between the organization and the Environment (March & Sutton, 1997; Cegarra-Navarro et al., 2016; Trumpp & Guenther, 2017). Prior research has demonstrated that green organizational culture may alter the way organizations think and that employees of the organization are key agents of change in this process (Hysing, & Olsson, 2017; Roscoe et al., 2019). Wang (2019) suggested that organizations are more likely to implement a green culture approach if their management values are strong and environmental protection concerns are expressed (Leonidou et al., 2015; Chen et al., 2015). A formally green organizational culture based on environmental principles may ease and integrate activities in an organization concerning many environmentally friendly products (Wang, 2019; Qu et al., 2021). As a result, a green organizational culture may be a valuable tool in assisting organizations in translating their ecologically proactive objectives into organizational performance (Glisson, 2015; Pham et al., 2018). The managerial challenge is to balance two opposite objectives in facing environmental pressures: choosing an optimal level of performance, although it can cut profits and achieve the lowest possible levels of efficiency to maximize profits (Levinthal & Workiewicz, 2018). Suppose organizations without a green organizational culture may be required to have limited resources for investment in their green strategy. In that case, top management may allocate these two key organizational priorities rather than environmental regulations. These resources, however, are needed to fund environmental action. This causes a manufacturing business to prefer the second goal. In contrast, green organizational culture may be a major driver of organization if organizations with a green culture face pressures from environmental protection to develop and disclose performance. The initial goal for optimum organizational performance may be the greatest option. As a result, it is proposed that:

*H1; Green organizational culture has a significant positive impact on organizational performance.*

**Green Organizational Culture and Environmental Performance**

It's worth discussing if green organizational culture leads to better environmental performance. Only a few pieces of research have been carried out to confirm the link between these two key constructs. Wang (2019) found that green organizational culture strongly predicts environmental performance across 321 Taiwanese manufacturers from various industries. Hadjri et al. (2019) and Hardika et al. (2019) showed that green organizational culture is positively linked to environmental performance in Indonesian research. Manufacturing companies that want to improve their environmental performance should try to create a learning environment inside their "four walls" so that they can quickly adjust to changing environmental factors (Afum et al., 2020). According to several studies (Margaretha & Saragih 2013; Roscoe et al., 2019), manufacturing industries are more likely to establish and adopt a green culture if senior management shows more dedication and importance to environmental issues. As a result, to enhance environmental performance, senior management tends to continuously prioritize and monitor a broad range of environmental policies and take formal action to ensure that all other employees of the organization work toward environmental objectives. A green organizational culture-based organization, on the other hand, that wants to enhance environmental performance not only emphasizes top management support but also makes a deliberate effort to invest in other organizational workers about environmental projects. Green initiatives are included in mission statements by such organizations to guide organizational workers (Jabbour et al., 2013; Dangelico & Pontrandolfo, 2015) and further build workforce capable of addressing environmental issues to achieve better environmental performance. One of the primary reasons for implementing a green culture approach is to verify that the concept of environmental sustainability is ingrained in the minds of all employees. If businesses embrace a green culture based on a winning strategy that involves all organizational employees, environmental performance is expected to improve. Following the logic of the preceding reasoning, researchers hypothesize that:

*H2; Green organizational culture has a significant positive impact on environmental performance.*

**Green Organizational Culture and Green Innovation**

According to Porter et al., (2016), Green organizational culture is defined as the collection of assumptions, beliefs, symbols, and artefacts of an organization that represent a desire or need to function in an ecologically sustainable way. On the other hand, Green culture may be defined as the addressing of environmental issues as an organizational cultural value (Pham & Tuckova, 2018). Green organizational culture is a critical idea that all businesses should embrace in order to stay productive and competitive in the longer term (Mokhtar et al., 2016; Masri & Jaaron, 2017). According to Roscoe et al. (2019), an organization's culture may be considered "green" when employees go beyond profit-seeking goals in order to reduce the negative impact of organizational activities on the environment while maximizing the positive impact. Organizational green culture includes expectations, qualities, and artefacts that represent the organization's requirements and aspirations regarding environmentally sustainable activities (Tahir et al., 2019). To achieve and retain a competitive edge, organizations must establish a green culture and engage in green innovation initiatives. According to Scholz and Voracek (2016), organizations may contribute more to environmental preservation by adopting a green organizational culture.

Furthermore, the environmental actions will assist the organizations in developing and managing their employees' environmental responsiveness and a green culture, which will improve customer satisfaction and organizational performance by conserving energy, rationalizing water usage, and reducing waste and pollution (Pham et al., 2018). As a result, organizations need a culture that encourages innovative operations. For example, if their aim is green innovation, they should definitely communicate their green ideals across the organization. Green organizational culture ensures the successful implementation of green innovation since it impacts both the organization and its employees (Gürlek & Tuna, 2018). The significance of a green organizational culture as an antecedent of green innovation was investigated by Küçükolu and Pnar (2016) and Chandra et al. (2019). According to the findings of their research, green organizational culture has a substantial and beneficial impact on green innovation. According to Sepahvand et al., (2020), a green organizational culture may enhance green product innovation performance in an organization. Organizational culture may be regarded as a key influencing element on innovation, according to current research. As a result, the following hypothesis is put forth:

*H3; Green organizational culture has a significant positive impact on green innovation.*

**Environmental Performance and Organizational Performance**

Previous research has shown that businesses' constructive and sustained efforts to improve environmental performance increase stakeholder satisfaction, contributing to the development of competitive advantages (Stock et al., 1997). Huynh (2020) claimed that environmental pollution reduction and organizational productivity are well linked, with the results indicating that environmental performance has a favourable impact on organizational efficiency. Furthermore, good environmental performance may lead to various benefits for businesses, such as increased efficiency in the use of input resources, lower production costs, and a boost in organizational reputation, all of which can help businesses grow their market share (Chuang & Huang, 2018). The benefits may enable businesses to increase firm value and improve organizational performance. Huynh (2020) has reaffirmed the use of environmentally friendly practices to improve the performance of environmentally responsible firms to offer them good opportunities and various advantages that can improve their organizational performance by lowering pollution, risks and expenses of production and improving quality of results and business efficiency. In addition, Fraj-Andrés et al. (2009) and Manrique and Martí-Ballester (2017) suggested that firms with proactive environmental practices could achieve superior environmental performance. The findings reveal empirical evidence that environmental performance has a positive effect on organizational performance. Khanifah et al. (2020) also argued that businesses expect investors to react positively to their reputation as an organization to attract them to invest more capital in the firms, increasing their organizational performance and bringing the investors benefits and enhancing their strong value. The firms had better respond favourably to government regulations for environmental pollution than to take an active role in environmentally friendly activities to establish an organizational reputation and improve commercial efficiency.

*H4; Environmental performance has a significant positive impact on organizational performance.*

**Green Innovation and Organizational Performance**

Green initiatives are only implemented when organizations think that doing so would result in financial gains, operational improvements, and a boost to their competitive edge (El-Kassar & Singh, 2019). Green initiatives would certainly enhance the organization's overall environmental and organizational performance (Rao & Holt, 2005; Weng et al., 2015). Green innovation is divided into two categories: green products and green processes. Green product innovation refers to developing a new product or service that has no or less negative environmental effect than the existing or competing product (Paul et al., 2014). Green process innovation enhances current production processes and environmentally friendly technology to create products and deliver services with minimal environmental effect (Tang et al., 2018). The adoption of green product and process innovation is linked to a successful business strategy and its environmental performance (Chiou et al., 2011). Green supply chain management and organizational performance impact this relationship (Lin et al., 2013). Green innovation combines green product and green process innovation to reduce energy consumption and pollution emissions and trash recycling and green product design (Zhang & Zhu, 2019). In addition to internal and external pressures, green product and process innovation have been proven to influence competitive advantage via firm environmental culture and values (Wang, 2019; Li et al., 2018).

*H5; Green innovation has a significant positive impact on organizational performance.*

**The mediating role of environmental performance and green innovation**

The previous debate on the link between green organizational culture, environmental performance, green innovation, and organizational performance suggested that green organizational culture, environmental performance and green innovation should improve organizational performance. Literature showed that a green organizational culture enhances organizational performance considerably (Wang, 2019; Chandra, 2021). Despite this, Rokhyadi et al. (2015) and Tahir et al. (2019) have shown that green organizational culture has a mixed correlation with organizational performance. The link between green organizational culture and corporate performance is thus inconclusive and must be further investigated by adding a mediator variable. Environmental performance and green innovation are therefore utilized to mediate between green organizational culture and organizational performance. Figure 1 depicts a causal model that is evaluated in industrial settings to explain the connection between these variables. We thus suggest these hypotheses:

*H6. Environmental performance has significantly and positively mediated between green organizational culture and organizational performance.*

*H7. Green innovation has significantly and positively mediated between green organizational culture and organizational performance.*

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Figure 1. Research Model

 **Research Methodology**

**Measurement of variables**

The constructs included in this research are green organizational culture, environmental performance, green innovation, and organizational performance. All items of the suggested questionnaire were based on a 5-point Likert scale, from 1 "strongly disagree" to 5 "strongly agree". All the measuring items of the constructs were derived from prior research. Green organizational culture was assessed using Fraj et al. (2011) and Wang (2019), comprising six items. The environmental performance was evaluated using a scale established by Lisi (2015) and Ramanathan (2018), which comprised five items. Green innovation comprises eight items, out of which green product innovation consists of four items, and green process innovation consists of four items (Chen et al., 2006). While organizational performance was assessed using an eleven-item measure developed by Wu & Wu (2014) and Huynh (2020).

**Data collection and samples**

Data from the research were gathered in four Malaysian states, including Malacca, Johor, Selangor and Kedah, from manufacturing firms. These regions were chosen for the study by the researchers owing to the strategic saturation of manufacturing firms. These areas are home to many of Malaysia's industries.  Before data collection, the research was carried out by 550 manufacturer companies from various sectors ([Apparel & Clothing](https://www.listofcompaniesin.com/malaysia/apparel-clothing/manufacturing.html), [Beauty & Personal Care](https://www.listofcompaniesin.com/malaysia/beauty-personal-care/manufacturing.html), [Chemicals, Plastics, and Raw Materials](https://www.listofcompaniesin.com/malaysia/chemicals-plastics-and-raw-materials/manufacturing.html), [Food & Beverage](https://www.listofcompaniesin.com/malaysia/food-beverage/manufacturing.html), and [Furniture & Furnishings](https://www.listofcompaniesin.com/malaysia/furniture-furnishings/manufacturing.html)). Of the 550 manufacturing companies, 315 agreed to be included in the research. Thus, 315 questionnaires were distributed to these companies by e-mail as COVID-19 cases increased in these states. However, only 170 questionnaires valid and completed were collected and deemed suitable for study. This represented a 54 per cent response rate.

**Profile of respondents**

Demographic representation was shown in Table 1, as 170 managers and owners from manufacturing industries comprise the Malaysian population. 130 (76%) of responders are male, while the remaining 40 (24%) are female. Also, 83 (49%) respondents fall in the range of 45–55 years, followed by 34 (20%) in 25–35 years while, in the range of 35–45 and above 55, followed by 40 (23%) and 12 (8%). Similarly, in marital status, 27 employees were (16%) unmarried, and 143 employees were married (84%). In terms of education, 91 (51%) of the respondents have obtained a master's degree, 56 (33%) a bachelor's degree, and the remaining 15 (9%) diploma and 8 (5%) PhD degree education. Additionally, in terms of job experience, about 77 (45%) of respondents have 11-15 years of experience, while about 45 (27%) have 16 or above years of experience, about 36 (21%) have 6-10 years of experience, and the other 12 (7%) have 1-5 years of experience. Moreover, 52 (31%) of respondents are employed as a sales manager, while another 48 (28%) are employed as a firm owner, and 39 (23%) of respondents are employed as a finance manager, while another 31 (18%) are employed as an HR manager. As mentioned in the table below, 47 (27%) respondents from [Furniture & Furnishings](https://www.listofcompaniesin.com/malaysia/furniture-furnishings/manufacturing.html) as followed by 44 (26%) [Beauty & Personal Care](https://www.listofcompaniesin.com/malaysia/beauty-personal-care/manufacturing.html), 42 (25%) [Food & Beverage](https://www.listofcompaniesin.com/malaysia/food-beverage/manufacturing.html) and 37 (22%) were from [Apparel & Clothing](https://www.listofcompaniesin.com/malaysia/apparel-clothing/manufacturing.html) industries. According to the study, data were collected from various Malaysian states, such as 50 (29%) respondents from Malacca, 62 (37%) Johor, 39 (23%) Selangor and 19 (11%) respondents from Kedah.

Table 1 Demographic profiles

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Characteristics** | **Option** | **Frequency** | **Percentage (%)** | **Total** |
| Gender | Male | 130 | 76 | 170 |
| Female | 40 | 24 |
| Age  | 25–35 | 34 | 20 | 170 |
| 35–45 | 40 | 23 |
| 45–55 | 83 | 49 |
| 55 – above | 13 | 8 |
| Marital Status | Single | 27 | 16 | 170 |
| Married | 143 | 84 |
| Education | Diploma | 15 | 9 | 170 |
| Bachelor's degree | 56 | 33 |
| Master’s Degree  | 91 | 53 |
| PhD | 8 | 5 |
| Work Experience | 1–5 years | 12 | 7 | 170 |
| 6-10 years | 36 | 21 |
| 11–15 Years | 77 | 45 |
| 16 or above Years | 45 | 27 |
| Position | Owner | 48 | 28 | 170 |
| HR Manager | 31 | 18 |
| Finance Manager | 39 | 23 |
| Sales Manager | 52 | 31 |
| Types of Manufacturing  | [Food & Beverage](https://www.listofcompaniesin.com/malaysia/food-beverage/manufacturing.html) | 42 | 25 | 170 |
| [Apparel & Clothing](https://www.listofcompaniesin.com/malaysia/apparel-clothing/manufacturing.html) | 37 | 22 |
| [Beauty & Personal Care](https://www.listofcompaniesin.com/malaysia/beauty-personal-care/manufacturing.html) | 44 | 26 |
| [Furniture & Furnishings](https://www.listofcompaniesin.com/malaysia/furniture-furnishings/manufacturing.html) | 47 | 27 |
| States | Malacca | 50 | 29 | 170 |
| Johor | 62 | 37 |
| Selangor | 39 | 23 |
| Kedah | 19 | 11 |

**Data analysis and results**

Partial least squares structural equation modelling (PLS-SEM) was used to investigate the connections shown in Figure 1. The software used was Smart PLS 3.3.3. Rather than using the conventional covariance-based approach, PLS-SEM was employed in place of that. This is because PLS-SEM needs a large sample size, as required by CB-SEM (Kline, 2012). PLS-SEM is a beneficial technique for assessing a complex, hierarchical model reflecting soft modelling assumptions appropriate and favourable for SEM (Papadopoulos et al., 2017). Complex models are often used for quality assurance in business analytics (Papadopoulos et al., 2017). The validation of the measurement model is the first stage in using the PLS-SEM technique, and the structural model path calculation is the second. The validity of the measurement model is determined by evaluating the constructs' convergent and discriminant validity and their reliability (Wetzels et al., 2009). The structural model is fitted by calculating the path coefficients once the model has been verified.

**Measurement of Model**

The findings of the measurement model are shown in Tables 2 and 3 (reliability, validity, correlations, and factor loading). Cronbach's alpha and composite reliability tests were used to evaluate internal consistency for the constructs of Environmental performance, Green innovation, Green organizational culture, and organizational performance, as recommended by Hair et al. (2021). The Average Variance Extracted (AVE) method was used to assess convergent validity. The item loadings were examined to see whether the index was reliable for model measurement. Each measure's loading should be at least 0.70 to ensure that the index's reliability is maintained (Hair et al., 2021). All of the loads complied with the requirements. Cronbach's alpha and composite reliability were used to evaluate the reliability of all reflective constructs. Most previous research has regarded Cronbach's Alpha and composite reliability as a minimal criterion to be above or equal to 0.7, with values less than 0.6 being thought to indicate a lack of reliability (Asadi et al., 2017). Cronbach's alpha and composite reliability both satisfy the required criteria; therefore, the internal consistency reliability can be deemed acceptable, according to Table 2. Convergent validity was determined using the Average Variance Extracted (AVE) method, which can be accepted if all of the constructs had AVE values greater than 0.5. (Fornell and Larcker, 1981). Table 2 shows that the Average Variance Extracted (AVE) ranged from 0.503 to 0.659, which met the criteria. To evaluate the discriminant validity of the research instrument, the Fornel-Larker criteria test was used. Table 3 demonstrates that the squares roots (correlation with other constructs) of each construct were greater than the sum of squares derived from each construct, supporting the discriminant validity of the survey instrument.

Table 2 Constructs' reliability and convergent validity.

|  |  |  |  |
| --- | --- | --- | --- |
| **Constructs** | **Cronbach's Alpha** | **Composite Reliability** | **Average Variance Extracted (AVE)** |
| Environmental performance  | 0.833 | 0.883 | 0.602 |
| Green innovation | 0.926 | 0.939 | 0.659 |
| Green organizational culture | 0.877 | 0.908 | 0.624 |
| Organizational performance  | 0.858 | 0.888 | 0.503 |

Table 3 Fornelle-Larcker criterion analysis.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Constructs** | **ENP** | **GNI** | **GOC** | **ORP** |
| ENP | **0.776** |   |   |   |
| GNI | 0.676 | **0.812** |   |   |
| GOC | 0.733 | 0.613 | **0.790** |   |
| ORP | 0.758 | 0.796 | 0.761 | **0.709** |

ENP= Environmental performance; GNI= Green innovation; GOC= Green organizational culture; ORP= Organizational performance.

Note: The highlighted values demonstrate that the AVEs are greater than the correlation, and therefore indicate discriminative constructs.

Table 4 Heterotrait – Monotrait (HTMT)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Constructs** | **ENP** | **GNI** | **GOC** | **ORP** |
| ENP |  |  |  |  |
| GNI | 0.761 |  |  |  |
| GOC | 0.853 | 0.675 |  |  |
| ORP | 0.867 | 0.871 | 0.837 |  |

ENP= Environmental performance; GNI= Green innovation; GOC= Green organizational culture; ORP= Organizational performance

To evaluate the model's validity and multicollinearity, it is important to calculate the Heterotrait–Monotrait HTMT ratio. According to Henseler et al. (2015), HTMT is the relationship between trait correlation and the correlation within each trait. Table 4 states that if the HTMT value is projected to rise by more than 0.9, it will lack discriminant validity. From Table 4, it is clear that all constructs have met the threshold value, which means our reflective model has reached the discriminant validity.



Figure 2 Measurement Model

**Structural Model**

The path coefficients were calculated in the second stage of the PLS-SEM technique. The path coefficients between the determinants of green organizational culture, green innovation, environmental performance, and organizational performance were calculated while evaluating the structural model. The hypotheses are evaluated using SmartPLS 3.3.3 to estimate the research model and examine the structural path. The measurement model was performed in the previous part, and this section contains a structural model. The researchers compute the p-value and t-value in the structural model to test the given hypotheses. The suggested hypotheses are accepted if the t-value is higher than 1.96, the p-value is less than 0.05, and vice versa. Figure 3 shows the findings of both the inner model path coefficients and the outer loadings. The bootstrapping method's findings are presented in Table 5 below.



Figure 3 Structural Model

In light of the predicted relationships, it is clear that green organizational culture has a significant positive impact on organizational performance (β = 0. 642, t = 18.924, p-value = 0.000), indicating that H1 is supported. Furthermore, the findings show that green organizational culture has a significant positive impact on environmental performance (β = 0. 753, t = 28. 885, p-value = 0.000), supporting H2. Green organizational culture also has a significant positive impact on green innovation (β = 0. 630, t = 11. 842, p-value = 0.000), indicating that H3 is supported. Furthermore, the results H4 is supported (β = 0. 385, t = 6. 781, p-value = 0.000), which states that environmental performance has a significant positive impact on organizational performance. Green innovation has a significant positive impact on organizational performance (β = 0. 559, t = 10. 562, p-value = 0.000), according to the results of H5. Environmental performance and green innovation were modelled in the present research as a mediating variable between green organizational culture and organizational performance. H6 environmental performance mediates the relationship between green organizational culture and organizational performance (β = 0. 290, t = 6. 362, p-value = 0.000), according to the findings. Furthermore, it was shown that green innovation mediates the relationship between green organizational culture and organizational performance (β = 0. 352, t = 7. 263, p-value = 0.000). As a result, we can safely say that H7 mediates the relationship between green organizational culture and organizational performance.

Table 5 Hypotheses results

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Hypotheses** | **Paths** | **β - value** | **S. D** | **T. Values** | **P. Values** | **Results** |
| H1 | GOC -> ORP | 0.642 | 0.034 | 18.924 | 0.000 | Supported  |
| H2 | GOC -> ENP | 0.753 | 0.026 | 28.885 | 0.000 | Supported |
| H3 | GOC -> GNI | 0.630 | 0.053 | 11.842 | 0.000 | Supported |
| H4 | ENP -> ORP | 0.385 | 0.057 | 6.781 | 0.000 | Supported |
| H5 | GNI -> ORP | 0.559 | 0.053 | 10.562 | 0.000 | Supported |
| H6 | GOC -> ENP -> ORP | 0.290 | 0.046 | 6.362 | 0.000 | Mediated |
| H7 | GOC -> GNI -> ORP | 0.352 | 0.049 | 7.263 | 0.000 | Mediated |

**Predictive relevance and effect size**

Some researchers provide another approach to calculating the prediction accuracy of the PLS path model in order to determine the value of Q2 and R2 (Stone, 1974). The Q2 is calculated by utilizing the blindfolding method in SmartPLS 3.3.3. A value of Q2 higher than 0.02, 0.15, 0.35 shows that small, medium and large predictive relevance in that order, according to Cohen et al. (2013). The environmental performance (0.104) and green innovation (0.090) have a smaller predictive relevance effect, while organizational performance (0.376) has a large predictive relevance effect.  Since this research model has the predictive ability to explain endogenous constructs, the results of this research were meaningful. Researchers tend to say that applying f2 to every path coefficient in the structural model yields inaccurate results (Henseler et al., 2009). Cohen (1998) claims that the values of f2, 0.02, 0.15, and 0.35 are regarded as small, medium, and large effect sizes, and that statement is generally accepted. The value of f2 indicates if the effect of an exogenous construct on the endogenous one is substantial (Gotz et al., 2010). Table 6 shows that green organizational culture has a smaller effect on organizational performance, a large effect on green innovation, and a large impact on the environment. Green innovation has a medium effect on organizational performance, whereas environmental performance has a large effect. In other words, R2 explains the endogenous construct, which consists of all endogenous variables. The 0.767 R2 found in this research demonstrates that green organizational culture, green innovation, and environmental performance all positively impact an organization's performance. Out of 77% of organizational performance, all exogenous variables can be explained.  R2 can be classified into various categories, such as "weak" (a value between 0.02 and 0.13), "moderate" (a value between 0.13 and 0.26), and "substantial" (a value higher than 0.26).

Table 6 Predictive relevance and effect size

|  |  |  |  |
| --- | --- | --- | --- |
|  *f*2 | Innovation | Organizational Performance | Q2 |
| Green organizational culture |  |  0.074 |  |
| Environmental performance |  |  0.452 | 0.104 |
| Green innovation |   |  0.205 | 0. 090 |
| Organizational Performance |   |   | 0.376 |

**Discussion and conclusion**

This article is about finding out if and how a green organizational culture and environmental performance are associated with superior organizational performance. We'll also look at how the relationship between environmental performance and green innovation is connected to the process of creating a green organizational culture in manufacturing organizations in Malaysia. Based on the results, it can be concluded that green organizational culture has a beneficial impact on manufacturing company performance in Malaysia. Although Wang (2019) reported similar findings, Chandra et al. (2021) showed a positive effect on performance by introducing a green organizational culture. In contrast, Sharma et al. (2021) determined that including green organizational culture leads to better overall business performance. Finally, Sudaryati et al. (2020) found that green organizational culture significantly improves the Indonesian.  Like Hadjri et al. (2019) and Martinez-Conesa et al. (2017) discovered that green human resource management and green organizational culture serve as constraints for a business that may help align its model. This research fills the gap by revealing the impact of environmental performance on the level of green organizational culture. Meanwhile, green organizational culture significantly determines that green innovation leads to organizational performance. The organization's environmental performance increases considerably due to these measures. Similar to Huyen Huynh (2020), we concluded that an organization's performance improves substantially when it improves environmental performance. Despite this, Fitria (2021) showed that organizational performance measurement did not depend on environmental tactics. More to the point, the pursuit of green innovation improves organizational effectiveness considerably. The findings support those of El-Kassar & Singh (2019), Ifrim et al. (2018), and Wang et al. (2021), who showed that green innovation could help businesses gain a competitive edge.

**Implications of the study**

A significant contribution to theoretical understanding is the combination of particular types of research results that provide new knowledge and insight to a problem that is considered essential for increasing firm performance. This study provides a novel and groundbreaking insight based on empirical data on green organizational culture, environmental performance, green innovation, and organizational performance. This research has relevance to practitioners, researchers, policymakers, and managers alike. The result is that because of its role in the association between green organizational culture and organizational performance and the mediation effect of environmental performance and green innovation, the theory's assumptions help determine the association between green organizational culture and organizational performance.  Various mediators used in previous study related to green organizational culture and firm performance (Chandra et al., 2021; Al-Swidi et al., 2021). This research furthers existing literature to explore how environmental sustainability, green organizational culture, green innovation, and success of the organization are all related in light of the Malaysian manufacturing sector. This study provided previously unknown methods of measuring organizational effectiveness and included a comparative analysis on the industrial sector. This research is particularly interesting because it describes major industrial companies' internal and external mechanisms that regulate organizational culture, environmental performance, and green innovation in their performance.

**Limitations and future study**

Currently, there are limitations to the study. This research showed that having green organizational culture, as well as being environmentally conscious and developing green innovation, may have a positive impact on manufacturing sectors in Malaysia. It is also essential to do further research in order to examine other variables that affect the firm's business performance. Also, it's important to note that only those from the manufacturing sector were part of the study's sample. That implies other sectors should exercise extreme caution when applying these results since there are perhaps significant variations across industries that may alter the effect of these variables. Additionally, the data utilized here is sourced from several Malaysian states, including Johor, Selangor, Malacca, and Kedah, all of which have diverse and distinct manufacturing sectors. The development of a specific technology will, however, vary depending on industries and regions. This same research may be done in other regions throughout the country, allowing for comparison and gathering of additional information.

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