The Effect of Green Organizational Culture and Green Innovation in influencing Competitive Advantage and Environmental Performance

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***Abstract*— The preset study investigated the role of green organizational culture as the antecedent of both green product and process innovation. In addition, the current examination also analyzed the unique contribution of both product and process innovation in prompting organizational competitiveness and environmental performance in Malaysian companies. In doing so, we apply Partial Least Square equation modeling approach. The results of the examination confirm that green product innovation, green process innovation and competitive advantage have positive and significant influenced by green organizational culture. Moreover, the results of PLS-SEM likewise confirm that competitive advantage is positive and significantly influenced by green product innovation and green process innovation. The outcomes further affirm that competitive advantage has positively and significantly impact on environmental performance in Malaysian manufacturing firms.**

***Keywords*—** *Green organizational culture, green product innovation, green process innovation, environmental performance, Malaysia.*

1. Introduction

With growing global warming and adversity in environmental conditions, governments and policy makers are facing extreme concerns for the stability of future development, growth process and secure endurance of human kind [1].

The rise of technology in human life opens the doors of efficiencies in processing with lucrative growth, however, the extensive use of natural resources and energy dependence in industrial developments have resulted in augmented environment burden [2, 3].In compliance to rapid reduction in ecological state, there exist a shift of trend in modern businesses for the notion of sustainability. The increased environmental awareness led to encourage enterprises in attaining the objective of 'green growth' in order to fulfil organizational goals with full consideration to the prospect of sustainable development [4]. This required firms to give greater attention to ecological issues by exercising least mutilation to the environment through its functions [1, 2].

In the existing environmental era, the importance of sustainable development for the businesses are encouraged for multiple reasons [4]. First, the aspect of sustainability is not a regional or a domestic phenomenon, instead it is a global issue that encompasses a widespread consideration from countries around the World, thus eminent for the existing globalized economies that heavily depend on trade, foreign investments and international alliances [5]. Second, the adoption of eco-friendly practices and the reduction of business operations that are considered harmful to the environment are contained by modern businesses as an unavoidable measure due to strict regulations imposed by governments [3]. Third, witnessing the rising demand from customers for sustainable products and services, the assimilation of green practices in contemporary businesses is also referred as a strategic course of giving the organization a customer driven view [6]. In addition, the notion of becoming green is also resulted from organization's self-consciousness for holding itself responsible for contributing in environmental performance [7].

On the way of becoming environmentally accountable, the aspect of green innovation is crucial for providing several advantages to the adopting firm. By definition, green innovation involves the inventive strategies, resource allocation and management, in the course of

product and process creation, that fulfill the ecological objectives and reduce environmental pressure during product life-cycle [4]. Hence, there exist two major forms of green innovation. They are green product innovation (hereafter, GPDI) and green process innovation (hereafter, GPRI). In this regard, GPDI includes the formation of products or services that conveys none or insignificant harmful impact on ecological conditions [8]. On the other hand, GPRI is the improvement of existing creation strategies and use of renewable sources to generate goods and offer benefits that drive none or lessened damaging impact on environmental conditions [8]. The advantages of eco-friendly innovations brought about elevations in the form of information improvements, time productivity & cost decrease, thereby influence organizational competitiveness and performance. However, the fruitful assimilation of green innovation into improved performance relies on organizational inclination to accept sustainable business methods.

In this regard, the importance of organizational culture is critical to drive the successful implementation of green innovation in influencing firm's competitiveness and performance [6]. At present, numerous organizations update their strategies, managements and operations so as to decline environmental contamination with limited resource usage, however, at many levels such changes are inadequate to guarantee sustainable development [9]. Organizational culture is characterized as a framework that incorporates images, values, thoughts, implications, dialects, practices, and desires, which is acknowledged and shared by the individuals from the association so as to control them on the most proficient method to think and act properly [10]. In discussing the importance of shared aims for environmental management, [11] stated that the response to existing environmental adversity necessitate organizations to promote cultural change & transformation process in order to drive the fruitfulness of environmental management. Hence, the importance of green organizational culture (hereafter, GOC) is vital to support the effective implementation of green policies. In other words, in the absence of shared organizational objectives across the internal and external stakeholders, the efforts for green growth are unproductive. Thus, GOC inspires the organization for contributing in environmental performance, thereby is considered critical to contribute in enhancing efficient green innovation and firm competitiveness with improved environmental performance [12].

Hence, considering the numerous advantages of adopting eco-friendly practices, organizations in today's world are keen to implement environmentally focused strategies and operations to ensure sustainability. On the other hand, ensuring the successful implementation of green strategies, the companies are required to encourage the widespread adoption of environmental management in organizations' members to generate the supporting green culture that fosters green innovation and brings improvements in organizational performance. Acknowledging the importance of green innovation in manufacturing sector, many studies strives to analyze the influence of green innovation in causing firm performance. However, there exist very limited studies that examined the vitality of organizational culture in driving green innovation and environmental performance [9].

In response, the current study seeks to explore the contribution of GOC in driving green innovation to determine firm's competitiveness and performance in Malaysian manufacturing sector. Unlike prior investigations that analyzed only GPDI [13] or GPRI [4] or solitary green innovation, without disaggregating its components [9], the present study examined the two most crucial aspects of green innovation in the form of GPDI and GPRI separately. In doing so, the preset study investigated the role of GOC as the antecedent of both GPDI and GPRI. In addition, the current examination also analyzed the unique contribution of GPDI and GPRI in prompting organizational competitiveness and environmental performance in Malaysian companies. Witnessing the growing need in organizations to meet societal and legislative pressure of ecological fortification [14], the findings of the study could assist firms in reducing environmental predicament through exuberant GOC and productive green innovations that underly the tendency of augmenting firm's competitive advantages and improve environmental performance.

The layout of the current study is organized as follow. Section two reviewed the existing literature of performance by focusing the link between green innovation, competitive advantage for environment performance. Section three presented the methodology of the current study by reporting the process of data collection and measure information. Furthermore, section four provide the statistical analysis and interpretation of the derived results. Finally, section five explained the conclusion of the research outcomes.

2. Literature review and hypotheses development

The declining health of present environment have stimulated enhanced organizational concerns for adopting numerous measures of decreasing ecological burden and contribute in improving environmental performance. This is followed by literature's rising interest in investigating the link of sustainability with firms' behavior and performance. In this regard, many studies analyzed the nexus of sustainable management and organizational competitiveness [16], [17]; eco-friendly investments and corporate behavior [18], [19] and green innovation and financial performance [20], [15].

Bearing in mind the evolving importance of green innovation, organizational culture is referred as a vital tool of inspiring environmental innovation. This involves the assimilation of tactically creative strategies in administrative processing and product generation. The aspect of green innovation is considered effective when it offers organization augmented efficiency and monetary improvements along with superior environmental performance. However, the extent to which sustainable innovation influence performance and organizational competitiveness differ with firm's organizational culture [21]. The cultural layout of the associations is a noteworthy determinant of the ecological policies [22]. As culture prompts organization's members to behave mutually in accordance to social qualities [23]. GOC helps companies to shape sustainable practices with greater empathy and mutual responsibility to drive innovation and improve ecological issues [9]. Furthermore, GOC assist the successful application GPDI and GPRI through sharing green values to foster the execution productive green strategies. Hence, as asserted by [12]. GOC support companies' employees to appreciate sustainable methods by generating the circumstances to shape, improve and stimulate the employment of product and process innovation [12].

In this regard, many studies examine the impact of GOC in influencing sustainable innovation. Among them, [24] established that firm can attain improved assimilation of eco-friendly practices by generating and motivating GOC for as a part of the sustainability efforts. Similarly, [25] also reported that eco-driven culture could lead to employ sustainable strategies with enhanced productivity. Furthermore, [26] in studying the association between GOC and sustainable innovation found the significant impact of GOC on innovation. The results of the study concluded that GOC brings positive influence on sustainable innovation suggesting that improved GOC lead to cause successful implementation of green innovation. Similar results were found in the study of [12], [9]. Thus, the current study hypothesizes that;

Hypothesis 1: GOC is significant to influence GPDI.

Hypothesis 2: GOC is significant to influence GPRI.

Furthermore, the appreciation for sustainable practices in organizational culture with augmented awareness lead to generate firm's image of being environmentally responsible and offers significant competitive edge. In this regard, [27] established that GOC underlies the redundancy to act as a barricade against competitors by enabling smooth application of ecological strategies and decisions. In addition, [28] discovered that organization's ecological ethics are significant to foster firm's competitiveness. The findings of the study established that ethical consideration for environment among organization's members brings positive impact on firm's competitiveness. More recently, [9] also examined the role of GOC in driving green innovation and competitiveness. Analyzing the data of Turkish hotel industry, the results of the study reported that GOC is a significant contributor of green innovation and organizational competitiveness. The study further established that improvements in GOC brings positive influence on green innovation implementation that led to prosper organization's competitive advantages. Hence, on the basis of above literature, the current study hypothesizes that;

Hypothesis 3: GOC is significant to influence organization's competitive advantage.

In the view of resource based (RBV) theory, organizational competitiveness resulted from organization's internal abilities, expertise and resources [29], [30]. According to the fundamentals of RBV, the presence of sporadic, valued, original & untransposable features of organizational resources empower firms to enhance competitiveness [31]. In this regard, [32] established that organization's expertise that underlies the attribute of evading pollution, safeguarding sustainability & create resolutions for ecological problems resulted in delivering superior competitiveness to the business. In this context, ecological innovations in the form of green inventive strategies, methods and procedures are referred as a vital source of enhancing organizational capabilities to cope with adverse environmental conditions. In this regard, many

studies suggested that green innovation improves firm's capacity to fight against ecological pressures and brings efficiency to foster sustainability and competitive edge [28], [27].

Among them, [22] established that implementations of green innovation bring greater competitiveness in Balearic Islands. Similarly, In Turkey, [9] also concluded that green innovation is positively associated with firm's competitive advantage. Likewise, [33] in examining Greek hotel industry found that green innovations have the potentials of augmenting firm's competitive advantages. Hence, the existing study hypothesizes that;

Hypothesis 4: GPDI is significant to influence organization's competitive advantage.

Hypothesis 5: GPRI is significant to influence organization's competitive advantage.

Improved competitiveness offers betterment in organizational performance. As per RBV, organizational capabilities such GOC and green innovation resulted in offering greater competitiveness [9] and thus provide relative positional dominance that cause organization to accomplish better than competitors. Similarly, competitive advantages foster organizational growth and influence. In similar context, numerous investigations have identified the positive association between organization's competitiveness and performance. Successful green innovation generates complications of imitations and thus offers competitiveness that drives performance [34]. Hence, companies having higher competitive edge tends to perform well in growth and monetary aspect along with environmental domains of ensuring sustainable performance [35]. Acknowledging the contribution of green supply chain practices in driving organizational competitiveness and performance, [36] establish that competitive advantage is significant to influence firm performance suggesting that improved competitiveness enhance organization's performance, Hence, the current study hypothesizes that;

Hypothesis 6: Competitive Advantage is significant to influence firm's environmental performance.

Figure 1 presents the research model of the current examination.

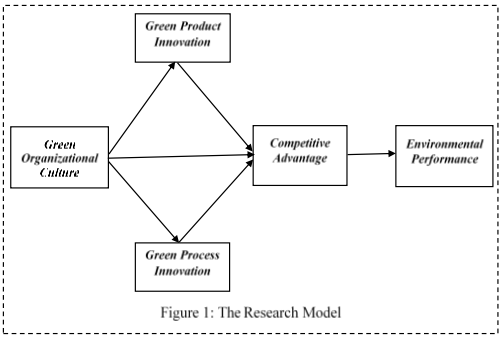

Figure 1: The Research Model

3. Methodology

3.1. Data Collection and Sample

The methodology of data collection in the current examination is finished by collecting data from the manufacturing organizations of Malaysia. The assurance of the manufacturing organizations sample has taken by following [3] that developed that manufacturing ventures have greater customer driven, innovation and information power. Along these lines, we select 97 firms within the manufacturing segment by distributing the questionnaire to the different manufacturing outlets in every one of the fourteen states of Malaysia. For progressively data collection, we transcribed our survey instrument in to English language and distributed to the selected manufacturing firms. Consequently, a total of 479 review instrument were sent using both on the hard and soft copy of the online survey questionnaire. The method of data gathering took a period of total seven months and got 379 survey answer with the response rate of 79.12%.

3.2. Measures

The current examination broke down the influence of green organizational culture and green innovation in effecting competitive advantage and environmental performance in Malaysia manufacturing ventures. So as to accomplish this objective, we analyze the hypothesized model appeared in Fig. 1. The properties of the investigated factors are examined by utilizing the Likert scale system 5 (Strongly Agree) to 1 (Strongly Disagree). Collectively, the current study utilized five components to be reinvestigate. They involve green product innovation (GPDI), green organizational culture (GOC), green process innovation (GPRI), competitive advantage (COM) and environmental performance (ENP). The research utilized in collection of 20 items including four items of GPDI and GPRI are adapted from the previous investigation of [27], four items of GOC are adapted from [37]. For assessing competitive advantage, we adapted four items from the prior

research of [28]. Finally, the current study utilized four measures of environmental performance adapted from the study of [41].

4. Data Analysis

The data investigation of the current research is finished by using the SmartPLS Version 3.2.8 [49] and Statistical Package for Social Sciences (V-23). A last substantial sample utilized in the current investigation is 350 by expelling univariate and multivariate anomalies. The methodology for identifying of univariate and multivariate outliers are Z-test score and Mahalanobis distance (D2) by using SPSSS (Version 23) and remaining of information analysis is done by using SmartPLS. Displayed Table 1 is the arrangement and structure of the valid answers of the collected sample utilized in this examination. Also, Table 2 illuminate the mean, standard deviation and Pearson's Correlation of the variables utilized in the current investigation. Additionally, to identify the issue of multicollinearity, the current study uses [38] found that the vast majority of the properties in the Pearson's Correlation investigation ought to under 0.90. Therefore, confirm the absence of multicollinearity among the variables [38], [39], [40].

Table-1: Descriptive Statistics

Gender			
		Frequency	Percent
Valid	Female	145	41%
	Male	205	59%
	Total	350	100%
Age			
		Frequency	Percent
Valid	20-30 years	39	11%
	31-40 years	112	32%
	41-50 years	161	46%
	51 and above	38	11%
	Total	350	100%
Working Experience			
		Frequency	Percent
Valid	1-5 years	79	23%
	6-10 years	178	51%
	11-15 years	54	15%
	More than 15 years	39	11%
	Total	350	100%
Education			
		Frequency	Percent
Valid	Undergraduate	38	11%
	Graduate	206	59%
	Post Graduate	25	7%
	Others	81	23%
	Total	350	100%
Source: Authors Estimation			

Table-2: Means, Standard Deviations, Pearson Correlations

MEAN	**SD**	**GPDI**	**GPRI**	**GOC**	**COM**	**ENP**
4.34	1.12	-				
4.09	1.09	0.36*	-			
4.24	1.45	0.29*	0.39*	-		
3.99	1.18	0.39*	0.41*	0.39*	-	
4.11	1.20	0.33*	0.42*	0.40*	0.41*	-
4.09	1.00	0.42*	0.37*	0.29*	0.42*	0.39*
N=350						
* Correlation is significant at the 0.01 level (2-tailed).						

Moreover, content validity is confirmed if the items using in the examination loads with greater value in their particular factor then different items displayed in the model, while internal consistency is accomplished if the valuation of Cronbach's alpha and composite reliability beats 0.7 [42], [43], [40], [38]. Factor loadings and composite reliability give in Table 3 which display that the greater part of the items is more than 0.7 and factor loading value in their distinctive factors which fulfilling the cut-off limit of earlier mentioned internal consistency.

Table-3: Measurement Model Results

		Factor Loadings	**Cα**	**CR**	**AVE**
Green Product Innovation	GPD1	0.90	0.86	0.84	0.61
	GPD2	0.87			
	GPD3	0.91			
	GPD4	0.81			
Green Process Innovation	GPR1	0.88	0.85	0.82	0.62
	GPR2	0.91			
	GPR3	0.92			
	GPR4	0.85			
Green Organizational Culture	GOC1	0.85	0.84	0.81	0.64
	GOC2	0.83			
	GOC3	0.88			
	GOC4	0.80			
Competitive Advantage	COM1	0.86	0.80	0.79	0.66
	COM2	0.82			
	COM3	0.77			
	COM4	0.82			
Environmental Performance	ENP1	0.84	0.81	0.82	0.59
	ENP2	0.83			
	ENP3	0.80			
	ENP4	0.78			
Source: Authors Estimation					

Additionally, convergent validity notifies to what extent an item of a specific factor combined and loaded to a near factor where they considered to be loaded [44], [45]. In the current investigation, convergent validity is asserted by using an average variance extracted (AVE) for each factor [46], [50]. They give threshold of more than and corresponding to 0.5 for affirming up the

convergent validity. In this way, AVE in Table 3 is asserting the essential measures.

Table-4: Discriminant validity Fornell-Larcker criterion

	GPDI	GPRI	GOC	COM	ENP
GPDI	0.78				
GPRI	0.39	0.79			
GOC	0.40	0.43	0.80		
COM	0.47	0.38	0.38	0.81	
ENP	0.21	0.49	0.37	0.33	0.77
Source: Authors Estimation					

In the next step, discriminant validity is revealed as how much an item of a specific single factor is unique and discriminant from interchange factors [47], [43]. As per [46], the discriminant validity is called to be established if the square root of AVE beats the pair-wise connection of the undercover factor. As appeared to be Table 4, italic values are the square root of AVE which is beating the off diagonal values which are the pair-wise connection of each factor (which are GPDI, GPRI, GOC, COM and ENP). The Table 5 exhibits the research loadings of various and separate factors henceforth confirming the cut-off limit. Thus, the discriminant validity is likewise stated if the Hetro Trait and Mono Trait proportion is lower than 0.85 as recommended by [48]. The outcomes in Table 6 uncovered that all factors have Discriminant validity.

Table-5: Results of Loadings and Cross Loadings

	GPD	GPR	GOC	COM	ENP
Green Product Innovation	0.90	0.34	0.47	0.23	0.48
	0.87	0.56	0.36	0.34	0.41
	0.91	0.14	0.26	0.30	0.46
	0.81	0.47	0.46	0.36	0.50
Green Process Innovation	0.88	0.26	0.62	0.28	0.37
	0.91	0.23	0.37	0.58	0.32
	0.92	0.14	0.27	0.51	0.35
	0.85	0.34	0.31	0.38	0.46
Green Organizational Culture	0.85	0.36	0.31	0.29	0.40
	0.83	0.23	0.49	0.32	0.52
	0.88	0.23	0.24	0.29	0.45
	0.80	0.56	0.45	0.20	0.39
Competitive Advantage	0.86	0.39	0.24	0.93	0.41
	0.82	0.50	0.49	0.82	0.58
	0.77	0.63	0.46	0.79	0.41
	0.82	0.45	0.38	0.84	0.35
Environmental Performance	0.84	0.30	0.25	0.35	0.51
	0.83	0.24	0.37	0.44	0.36
	0.80	0.36	0.56	0.40	0.43
	0.78	0.57	0.26	0.46	0.41
Source: Authors Estimation					

Table-6: Results of HTMT Ratio of Correlations

	GPDI	GPRI	GOC	COM	ENP
GPDI					
GPRI	0.593				
GOC	0.443	0.593			
COM	0.456	0.434	0.623		
ENP	0.601	0.558	0.568	0.449	
Source: Authors Estimation					

Finally, in partial least square methodology, basic model and hypothesis were assessed by assuming path coefficients. As per [46] suggestions, a bootstrapping strategy utilizing 1000 sub-sample was applied to confirm the measurable criticalness of all beta coefficient. This is in like way the standard of Smart-PLS programming. Table 7 uncovers beta coefficients adjacent their probability values.

Tabl-7: Results of Path Coefficients

Hypothesized Path	β	C.R	Sig.	Remarks
GPDI ← GOC	0.328	3.786	0.000	Supported
GPRI ← GOC	0.281	4.564	0.000	Supported
COM ← GOC	0.339	8.862	0.000	Supported
COM ← GPDI	0.543	4.059	0.000	Supported
COM ← GPRI	0.483	5.782	0.000	Supported
ENP ← COM	0.339	4.708	0.000	Supported
Note: Level of Significance (5% i.e. 0.050)				
Source: Authors' Estimation				

Table 7 demonstrated the outcomes of partial least square equation modeling d, regression path coefficient, t-statistics, probability values (p-values) and the comments related with theorized path. The results of the examination affirm that green product innovation (β= 0.328, p<0.000), green process innovation (β= 0.281, p<0.000) and competitive advantage (β= 0.339, p<0.000) have positive and essentially influenced by green organizational culture hence affirming **H1**, **H2** and **H3**. Besides, consequences of PLS-SEM likewise affirm that competitive advantage is positive and significantly influenced by green product innovation (β= 0.534, p<0.000) and green process innovation (β= 0.483, p<0.000) in this manner affirming **H4** and **H5**. The outcomes further affirm that competitive advantage (β= 0.339, p<0.000) has positively and significantly impact on environmental performance in Malaysian manufacturing firms.

5. Discussion and Conclusion

In the last few decades, growing global warming and adversity in environmental conditions, governments and policy makers are facing extreme concerns for the stability of future development, growth process and secure endurance of human kind [51, 52]. The rise of technology in human life opens the doors of efficiencies in processing with lucrative growth, however, the extensive use of natural resources and energy dependence in industrial developments have resulted in augmented environment burden [53, 54, 55]. In the existing environmental era, the importance of sustainable development for the businesses are encouraged for multiple reasons. First, the aspect of sustainability is not a regional or a domestic phenomenon, instead it is a global issue that encompasses a widespread consideration from countries around the World, thus eminent for the existing globalized economies that heavily depend on trade, foreign investments and international alliances [56]. Second, the adoption of eco-friendly practices and the reduction of business operations that are considered harmful to the environment are contained by modern businesses as an unavoidable measure due to strict regulations imposed by governments [57].

In response, the current study seeks to explore the contribution of GOC in driving green innovation to determine firm's competitiveness and performance in Malaysian manufacturing sector. Unlike prior investigations that analyzed only GPDI and GPRI or solitary green innovation, without disaggregating its components, the present study examined the two most crucial aspects of green innovation in the form of GPDI and GPRI separately. In doing so, the preset study investigated the role of GOC as the antecedent of both GPDI and GPRI. In addition, the current examination also analyzed the unique contribution of GPDI and GPRI in prompting organizational competitiveness and environmental performance in Malaysian companies. Witnessing the growing need in organizations to meet societal and legislative pressure of ecological fortification, the findings of the study could assist firms in reducing environmental predicament through exuberant GOC and productive green innovations that underly the tendency of augmenting firm's competitive advantages and improve environmental performance. The current examination broke down the influence of green organizational culture and green innovation in effecting competitive advantage and environmental performance in Malaysia manufacturing ventures. In doing so, we apply Partial Least Square equation modeling approach. The results of the examination confirm that green product innovation, green process innovation and competitive advantage have positive and significant influenced by green organizational culture. Moreover, the results of PLS-SEM likewise confirm that competitive advantage is positive and significantly influenced by green product innovation and green process innovation. The outcomes further affirm that competitive advantage has positively and significantly impact on environmental performance in Malaysian manufacturing firms.

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