Impact of Ecological Innovation, Entrepreneurial Self-efficacy and Entrepreneurial Orientation on Environmental Performance and Energy Efficiency

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ABSTRACT

The rise in environmental regulation also enforced several limitations on organizations to follow the globally accepted business activities and incentivize firms for implementing eco-friendly business methods. Keeping in mind, the current study seeks to analyze the ecological aspects of them by identifying the relationship of ecological innovation, entrepreneurial orientation and entrepreneurial self-efficacy in affecting a firm's energy efficiency and environmental performance. The findings of structural equation modelling ensure that all chosen factors have a significant and positive influence on energy efficiency and environmental performance of SMEs in Malaysia. Furthermore, the findings of structural equation modelling recommended that ecological innovation, entrepreneurial orientation and entrepreneurial self-efficacy have a positive and significantly influenced on energy efficiency and environmental performance. Technical speaking, the results confirm that the ecological innovation, entrepreneurial orientation and entrepreneurial self-efficacy are the key contributors to enhance the energy efficiency and environmental performance of SMEs in Malaysia.

Keywords: Ecological Innovation, Entrepreneurial Orientation, Energy Efficiency, Environmental Performance, Malaysia
JEL Classifications: L26, Q00, L25

1. INTRODUCTION

In modern times, the implementation of environmental protection in business practices has been evolved extensively. The continuous decline in environmental stability has insisted businesses be aware of growing environmental challenges and generate an environment of internationally coordinated green settings that provide a shared response to critical environmental issues. This involves protecting or limiting the utilization of natural resources along with eco-friendly business operations (Ali and Ahmad, 2016). In addition to self-conscious behaviors of business entities, the increased customer awareness regarding sustainable goods and services also encourage firms to focus on green business practices to enhance customer satisfaction and generate competitive advantage (Zaman and Shamsuddin, 2017). Simultaneously, the rise in environmental regulation also enforced several limitations

on organizations to follow the globally accepted business activities and incentivize firms for implementing eco-friendly business methods (Zheng et al., 2019; Zhou et al., 2017).

In compliance with the growing international urge for sustainable firm performance, many organizations have increased their investments in ecological protections, especially in last decade (Charter, 2017). There are several factors that assist organizations in achieving proficient environmental conservation, such as energy and resource efficiency, that can also improve firm's sustainability. In this regard, the notion of ecological innovation (EC-IN) has been recognized as potential contributor to improved environmental performance. By definition, the concept of EC-IN includes the contributions to technical and non-technical innovations that carry positive impact on environment (Horbach, 2016). Similarly, the entrepreneurial attributes of the organization also play crucial

role in articulating eco-friendly business vision followed by green business environment to support the objective of organization's sustainable performance.

Among the entrepreneurial properties of the firm's management, the attributes of entrepreneurial self-efficacy (henceforth, EN-SE) and entrepreneurial orientation (henceforth, EN-OR) are considered prominent. Chen et al. (1998) defines EN-SE as the individual's confidence in his/her ability to successfully achieve the tasks of business. These tasks consolidate business prospects, create innovative corporate settings, improve partner's relationship, assist company's significant objectives, adjust to outperform ecological troubles, and motivates workforce gifted skills (De-Noble et al., 1999). Lee et al. (2016) stressed that management with high EN-SE has confidence in their capacities and avoid self-doubting, which engages them to look for after innovative chances and progress determinedly while confronting inside and outside difficulties. Many studies in the current literature have highlighted the promising role of EN-SE in driving firm performance; however, Hmieleski and Baron (2008) recognized that EN-SE has not always resulted in improved organizational performance.

In addition, EN-OR is also highlighted as a critical contributor to improved firm performance. Covin and Slevin (1989) defined EN-OR as the inclination of management for being proactive, imaginative and ambitious in making entrepreneurial strategies, choices and their execution. Numerous investigations announced the implication of EN-OR in association's basic leadership and execution while showing mixed results regarding the link between EN-OR and firm's sustainable business practices. Among them, the greater consensus is drawn on the positive connection between EN-OR and performance (Jiang et al., 2018; Zhang et al., 2016). Alternatively, few examinations also identified that high EN-OR tends to decline firm performance (Tang et al., 2008; Wang, 2008) and could lead to disrupting firm's environmental goals. This clearly raises concern on the critical role of EN-OR on firm's future growth, competence and stability, making it more significance to examine.

Witnessing the signing of the drivers mentioned above of performance, the current study seeks to analyze the ecological aspects of them by identifying the relationship of EC-IN, EN-OR and EN-SE in affecting firm's energy efficiency and environmental performance. The expected results would not only highlight the specific connection of EN-IN, EN-OR and EN-SE with environmental performance but also are noble to explain their connection with environmental conservation strategy of energy efficiency. To the best of knowledge, no prior study has discussed in such detail the impact of the studied variables with energy efficiency.

The structure of the article is explained in the following. The second section of the current study will highlight the related studies and their results regarding the association of EC-IN, EN-OR and EN-SE with the environment and business performance. Next, section three will discuss the methodology regarding the data collection and explanation of considered variables. Section four will report the empirical findings and interpret the outcomes. Lastly, section five will conclude the article by presenting general conclusions and recommendations for future studies.

2. LITERATURE REVIEW

Numerous examinations have stressed on the crucial role of entrepreneurs in leading firm's vision of sustainability (Gaweł, 2012) In this regard, several studies have focused on the impact of entrepreneurial orientation (Marshall et al., 2015; Gagnon et al., 2013; Wiklund, 1999) and entrepreneurial self-efficacy (McGee and Peterson, 2019; Khedhaouria et al., 2015) in driving sustainable performance. Recently, the shift of interest in analyzing sustainable firm performance is shifted towards entrepreneurial attributes within-firm along with organizational urge for innovation (Wagner, 2017; Schaltegger and Wagner, 2011; Farrow et al., 2000).

Given the significance of environmental performance in capturing higher competitive advantage, modern literature is keen to identify the link between entrepreneurial attributes of the firm with the firm's eco-friendly business methods and ecological performance. Among them, Niemann et al. (2019) investigated the impact of firm's readiness for corporate entrepreneurship (RCE) on firm's environmental (ENP) and financial performance (FIP). In doing so, the study analyzed the data from 103 organizations. The empirical findings of the study reported that RCE carried significant impact on firm's financial as well as environmental performance. Particularly, the results revealed that rise in Firms RCE contained the tendency to augment organizations ENP and FIP.

In another study, Jiang et al. (2018) studied the role of green EN-OR on a firm's sustainable performance. In doing so, the study analyzed the data of 264 organizations OF China. The outcomes of the investigation found that Green EN-OR brought positive impact on firm's FIP. Similarly, the results also established the significant association of EN-OR with ENP stating that rise in green EN-OR is likely to boost organization's ENP. Moreover, Zhang et al. (2016) also analyzed the link between EN-OR and firm's performance utilizing the information of 164 organizations of China. The outcome of the study, similar to Jiang et al. (2018) found that EN-OR is significant to drive performance of Chinese organizations. On the other hand, using the qualitative approach, Jolink and Niesten (2015) also suggested that proper utilization of organization's entrepreneurial attributes is significant to generate the synergy between firm's ENP and ECP.

Alternatively, few studies reported the adverse impact of entrepreneurial orientation on an organization's sustainability and performance. Among them, Tang et al. (2008) investigated the contribution of EN-OR on business performance. The outcome of the study reported that EN-OR does not follow constant impact on organization performance and reflects negative impact in cases of high EN-OR. In another study, Yoon and Solomon (2017), while analyzing the association between EN-OR and performance also reported similar results. The study established that increase in EN-OR declines firm performance and persisted in a U-Curved relationship.

Discussing the role of entrepreneurial self-efficacy (EN-SE) along with EN-OR, McGee and Peterson (2019) examined the association of firm's entrepreneurial abilities in enhancing performance of new and mature organizations. The results of the examination documented that both EN-OR and EN-SE are significant to drive organization performance and benefits firm's future sustainability. However, the study found that the role of EN-SE is more vital than EN-OR in new organizations. On the other hand, the influence of EN-OR is found to be more profound in mature organizations.

Similarly, Khedhaouria et al. (2015) also examined the link between EN-OR and EN-SE with firm's performance. In doing so, the authors used the data of 264 small businesses in France. The results of the study found that both EN-OR and EN-SE play substantial role in influencing performance of small French businesses. Particularly, the results found the positive impact of both variables on the performance of small firms. Emphasizing the contribution of ecological innovation (EC-IN) in driving sustainable organizational performance, Costantini et al. (2017) examined the connection between EC-IN and ENP in European firms. The findings suggested that EC-IN is significant to drive ENP in European industries, thereby encourage the objectives of environmental sustainability. Particularly, the outcomes stated that rise in EC-IN carried positive impact on ENP of Europe.

Furthermore, Lee et al. (2016) also discussed the impact of EN-SE and EN-IN on firm performance. Using the data of 198 Australian food businesses, the findings revealed the significant connection of both predictors with firm performance. Specifically, the results found that the increase in EN-IN and EN-OR augments the performance of Australian food businesses. Similar results are reported by Hmieleski and Baron (2008) in analyzing the link between EN-SE on firm performance. Stressing on the role of EN-IN in boosting eco-friendly business operations, Fernando and Wah (2017) examined the impact of EN-IN on firm's ENP by utilizing the data of Malaysian firms. Utilizing the six measures to reflect EC-IN, the findings reported the significant contribution of EN-IN in driving environmental performance in Malaysia. Moreover, emphasizing the performance of energy innovation systems (ENIS), Miremadi et al. (2018) analyzed the Nordic firms using 90 indicators of innovation. The general finding of the study stressed that focus on energy efficiency and Research and development could assist augmenting the fruitfulness of EC-IN and lead to decline environmental degradation.

In another study, Lee and Min (2015) associated the aspects of energy efficiency, green research and development, carbon emanation and EC-IN with firm performance. The authors deliberated that environmental innovation could play a crucial role in declining pollution and carbon footprint. Similarly, product development in organizations assisted in boosting performance in operations by bringing energy efficiency and reduction in the levels of carbon emanations. Specifically, by using the data of organizations in Japan from the period of 2001 to 2010, the results confirmed that EC-IN is significant to

reduce carbon emanation, thereby improve firm's ENP. Hence, in the light of above, the present examination has formulated the following hypotheses.

H_1: EC-IN is significant to impact environmental performance.
H_2: EN-OR is significant to impact environmental performance.
H_3: EN-SE is significant to impact environmental performance.
H_4: EC-IN is significant to impact energy efficiency.
H_5: EN-OR is significant to impact energy efficiency.
H_6: EN-SE is significant to impact energy efficiency.

Presented in Figure 1 is the hypothesized framework of the current study.

3. METHODOLOGY

In this present assessment, the process for data collection is finished by amassing the information from the different SMEs in Malaysia. Furthermore, we opt 300 differing SMEs of Malaysia for the information gathering process. To get fast and smooth information collection procedure, we create an interpretation of our survey into the English language and forward to the chose SMEs of Malaysia. Besides, we gather a complete 450 research survey using printed and social media sites. The time for data gathering took a period of a total fourteen weeks and gathered 420 study survey with a reaction pace of 93.33%. The fundamental respondent for the present research is the lower, middle and upper-level supervisors of various SMEs of Malaysia.

Furthermore, the present examination takes a gander at the effect of ecological innovation, entrepreneurial orientation and self-efficacy on energy efficiency and environmental performance in SMEs of Malaysia. To accomplish this objective, the present examination investigates adopt a framework focused on previous works of literature, and the structure is displayed in Figure 1. The essential structures of the components are explained by consuming the Likert scale framework from 5 (Strongly Agree) to 1 (Strongly Disagree). In direct, the current assessment utilizes five specific segments. The variables utilized in this assessment are simply the ecological innovation (ECIN), entrepreneurial orientation (ENOR), entrepreneurial self-efficacy (ENSE), energy efficiency (ENE) and environmental performance (ENP). Moreover, the items of the variables used in this present examination are gotten from different past investigates. The present examination additionally satisfies all means of moral thought.

4. RESULTS AND INTERPRETATION

In this research, the information search is performed by adopting two unique statistical programmings, which are the Statistical Package for Social Sciences (Version-23) and SmartPLS V-3.2.9

Figure 1: Hypothesized model
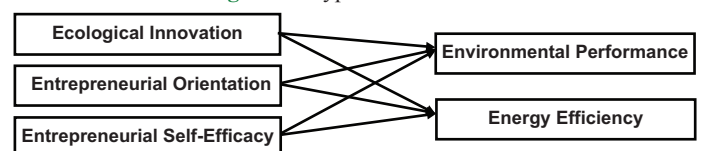
(Henseler et al., 2015). The final data utilized for the present examination is 401 bringing about excluding univariate and multivariate anomalies from the norm. The method for the

Table 1: Descriptive statistics

	Frequency	Percentage
Gender – (Valid)		
Female	255	64
Male	146	36
Total	401	100
Age – (Valid)		
20-30 years	89	22
31-40 years	1 93	48
41-50 years	67	17
51 and above	52	13
Total	401	100
Working experience – (Valid)		
1-5 years	48	12
6-10 years	235	59
11-15 years	53	13
More than 15 years	65	16
Total	401	100
Education – (Valid)		
Undergraduate	59	15
Graduate	222	55
Postgraduate	58	14
Others	62	15
Total	401	100

Source: Authors estimation

Table 2: Means and Pearson correlations

Variables	Mean	ECIN	ENOR	ENSE	ENE	ENP
ECIN	4.021	-				
ENOR	3.983	0.392**	-			
ENSE	3.678	0.275**	0.242**	-		
ENE	3.456	0.405**	0.347**	0.285**	-	
ENP	3.785	0.440**	0.394**	0.328**	0.338**	-

N=401. **Correlation is significant at the 0.01 level (2-tailed)

distinguishing of univariate and multivariate anomalies from the norm are Z-test statistics and Mahalanobis Distance (D2) with the help of SPSS, and further analysis is completed with the help of SmartPLS. Displayed Table 1 is the composition and arrangement of the data utilized in the current research. In Table 1, the ratio of male and female are different. 64% data are collected by female managers and supervisor however, 36% data is gathered from the male supervisors. In addition, 15% data is collected by the supervisor with the qualification equivalent to undergraduate, 55% are from equivalent to graduate, 14% are postgraduate and 15% is equivalent to other qualifications. Talking about working experience, 12% of supervisor and managers having an experience of 1-5 years, 59% managers are with the experience of 6-10 years, 13% managers are with the working experience of 11-15 years and 16% manager and supervisor are with the experience of equal or more than 16 years. Likewise, Table 2 describes the average and Correlation (Pearson's coefficient) of the information utilized in the recent examination. In like way, to deal with the matter of multicollinearity, we filter for the investigation of Hair et al. (2010) stated that a huge variety in the value of correlation (Pearson's coefficient) relationship should to <0.90. In this way, to support the absence of multicollinearity amid the variables (Sharif and Raza, 2017).

The results of descriptive insights are displayed in Table 1 with a comprehensive composition and structure of the gathered information. The descriptive measurements are additionally isolated into four diverse sub-classes, which are education, age, gender and work experience. Table 1 clarifies the descriptive of all the subclasses.

Furthermore, content legitimacy is made whether the association of the items employing in the analysis appeared with higher values in their precise variable in contrast with the items displayed up in the

Table 3: Measurement model results

Variables	Items	Factor loadings	Cronbach's alpha	Composite reliability	Average
Ecological innovation	ECIN1	0.916	0.893	0.873	0.603
	ECIN2	0.832			
	ECIN3	0.877			
	ECIN4	0.897			
Entrepreneurial orientation	ENOR1	0.842	0.902	0.856	0.593
	ENOR2	0.808			
	ENOR3	0.818			
	ENOR4	0.812			
Entrepreneurial self efficacy	ENSE1	0.814	0.934	0.872	0.612
	ENSE2	0.793			
	ENSE3	0.845			
	ENSE4	0.765			
Energy efficiency	ENE1	0.824	0.843	0.801	0.583
	ENE2	0.784			
	ENE3	0.811			
	ENE4	0.784			
Environmental performance	ENP1	0.802	0.881	0.832	0.543
	ENP2	0.794			
	ENP3	0.766			
	ENP4	0.747			

Source: Authors estimation

framework, while internal constancy is checked that the estimate of Cronbach's alpha and composite reliability are more prominent than 0.7 (Waseem et al., 2013; Khan et al., 2019). Moreover, the loadings of factor and composite reliability show in Table 3, which explain that an even estimate of the accumulates loadings of factor are higher than 0.70. Also, these values of factors reflect in their separate column, which assuring the inner legitimacy of the particular items.

Moreover, the convergent legitimacy uncovers to which amount an item concerning a specific variable appeared to various fragments where they anticipated to appear (Khan et al., 2019; Afshan et al., 2018). In the current study, convergent legitimacy is showed up by employing an average variance extracted (AVE) for every variable (Mehmood and Najmi, 2017; Fornell and Larcker, 1981). They provide the standard of further overpowering than and uncovered distinctively in association with 0.50 for requesting the convergent legitimacy. The results of AVE in Table 3 are ensuring significant coefficients.

In the following stage, discriminant legitimacy is revealed as to whether an item of a variable is different and special from various variables employed in a structure (Afshan et al., 2018). As showed up by Fornell and Larcker (1981), the discriminant legitimacy is acceptable if the square root parameter of AVE is higher than the pair-wise association of the anonymous variable (latent). The findings highlighted in Table 4, italic, and bold parameter are the AVE square root, which is higher than as far as possible, which is the pair-wise association of every variable. In addition, Table 5 shows the loadings of variables of other and specific variables, saying the edge of standard. In this way, the discriminant realness is additionally verified if the Hetro Trait and Mono Trait (HTMT) value are lesser from 0.85, as projected by Henseler et al. (2015). The findings in Table 6 discovered that entire parts have Discriminant validity.

In the last stage, we used a partial least square structure with looking at the framework and theory checking, which exhibiting beta factors, t-statistics, and P-value. As followed by Chin (1998) proposal, a bootstrapping structure employing 1000 sub-sample was linked to requesting the computable important calculations of the varied quantity of values. Table 7 discovers beta coefficients, t-statistics, and their significance value with the annotations about the theory and model checking.

The findings of the PLS-SEM are revealed in Table 7. The table presented the beta coefficient, t-stats value, P-value, and the status of hypothesis testing against each hypothesis. Normally, the findings establish that all chosen factors have a significant and positive influence on the energy efficiency and environmental performance of the SMEs in Malaysia. Furthermore, the findings of the structural equation modelling recommended that ecological innovation (β = 0.294, P < 0.000), entrepreneurial orientation (β = 0.302, P < 0.000) and entrepreneurial self-efficacy (β = 0.332, P < 0.000), have a positive and significantly influenced on energy efficiency, hence confirming H_1, H_2 and H_3. Moreover, the results further suggested that ecological innovation (β = 0.253, P < 0.000), entrepreneurial orientation (β = 0.364, P < 0.000) and

Table 4: Discriminant validity Fornell-Larcker criterion

	ECIN	ENOR	ENSE	ENE	ENP
ECIN	0.777				
ENOR	0.402	0.770			
ENSE	0.315	0.336	0.782		
ENE	0.268	0.286	0.285	0.764	
ENP	0.368	0.357	0.333	0.496	0.737

Source: Authors estimation

Table 5: Results of loadings and cross loadings

Variable	ECIN	ENOR	ENSE	ENE	ENP
Ecological innovation	**0.916**	0.351	0.489	0.238	0.497
	0.832	0.573	0.373	0.348	0.420
	0.877	0.146	0.273	0.315	0.471
	0.897	0.486	0.470	0.377	0.512
Entrepreneurial orientation	0.151	**0.842**	0.638	0.292	0.386
	0.145	**0.808**	0.387	0.597	0.328
	0.147	**0.818**	0.283	0.523	0.367
	0.146	**0.812**	0.321	0.390	0.474
Entrepreneurial self efficacy	0.189	0.146	**0.814**	0.300	0.415
	0.184	0.142	**0.793**	0.328	0.533
	0.196	0.152	**0.845**	0.302	0.469
	0.177	0.137	**0.765**	0.209	0.408
Energy efficiency	0.376	0.183	0.368	**0.824**	0.425
	0.759	0.174	0.647	**0.784**	0.574
	0.707	0.164	0.381	**0.811**	0.406
	0.587	0.174	0.647	**0.784**	0.350
Environmental performance	0.413	0.567	0.186	0.395	**0.802**
	0.602	0.477	0.184	0.444	**0.794**
	0.536	0.553	0.178	0.541	**0.766**
	0.428	0.746	0.173	0.500	**0.747**

Source: Authors estimation

Table 6: Results of HTMT ratio of correlations

	ECIN	ENOR	ENSE	ENE	ENP
ECIN					
ENOR	0.583				
ENSE	0.402	0.663			
ENE	0.397	0.547	0.555		
ENP	0.532	0.684	0.582	0.643	

Source: Authors estimation

Table 7: Results of path coefficients

Hypothesized path	Coefficient	CR	P-value	Remarks
ENE ← ECIN	0.294	4.422	0.000	Supported
ENE ← ENOR	0.302	6.221	0.000	Supported
ENE ← ENSE	0.332	4.676	0.000	Supported
ENP ← ECIN	0.253	5.776	0.000	Supported
ENP ← ENOR	0.364	3.786	0.000	Supported
ENP ← ENSE	0.336	1.960	0.050	Supported

Level of significance (5% i.e., 0.050)

entrepreneurial self-efficacy (β = 0.336, P < 0.000), have a positive and significantly influenced on environmental performance, hence confirming H_4, H_5 and H_6. Technical speaking, the results confirm that the ecological innovation, entrepreneurial orientation and entrepreneurial self-efficacy are the key contributors to enhance the energy efficiency and environmental performance of SMEs in Malaysia.

5. DISCUSSION AND CONCLUSION

The continuous decline in environmental stability has insisted business to be aware of growing environmental challenges and generate an environment of internationally coordinated green settings that provide a shared response to critical environmental issues. This involves protecting or limiting the utilization of natural resources, along with eco-friendly business operations. In addition to self-conscious behaviors of business entities, the increased customer awareness regarding sustainable goods and services also encourage firms to focus on green business practices to enhance customer satisfaction and generate competitive advantage. Simultaneously, the rise in environmental regulation also enforced several limitations on organizations to follow the globally accepted business activities and incentivize firms to implement eco-friendly business methods.

Witnessing the signing of the above-mentioned drivers of performance, the current study seeks to analyze the ecological aspects of them by identifying the relationship of EC-IN, EN-OR and EN-SE in affecting firm's energy efficiency and environmental performance. The expected results would not only highlight the specific connection of EN-IN, EN-OR and EN-SE with environmental performance but also are noble to explain their connection with environmental conservation strategy of energy efficiency. The results of structural equation modelling confirm that all chosen factors have a significant and positive influence on energy efficiency and environmental performance of the SMEs in Malaysia.

Furthermore, the findings of the structural equation modelling recommended that ecological innovation, entrepreneurial orientation and entrepreneurial self-efficacy have a positive and significantly influenced on energy efficiency and environmental performance. Technical speaking, the results confirm that the ecological innovation, entrepreneurial orientation and entrepreneurial self-efficacy are the key contributors to enhance the energy efficiency and environmental performance of SMEs in Malaysia.

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