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Article

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The Relationship of Environmental Uncertainty, Accounting Information System Efficiency and Energy Efficiency with Environmental and Operational Performance in Indonesia

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ABSTRACT

Focusing on the current environmental era, the present study aims to evaluate the role of accounting and environment in driving the firm's performance. Therefore, the study is motivated to evaluate the specific relationship of energy efficiency, accounting information system efficiency and environmental uncertainty with business performance. The current study measures the empirical impact of the performance drivers on two vital domains of a firm's performance. The results of partial least square structural equation modelling confirm that energy efficiency and accounting information system efficiency have a positive and significant impact on operational and environmental performance. Moreover, the results further suggested that environmental uncertainty have a negative and significant impact on operational and environmental performance in multinational firms of Indonesia.

Keywords: Environmental Uncertainty, Energy Efficiency, Operational Performance, Environmental Performance, Indonesia

JEL Classifications: Q55, Q50

1. INTRODUCTION

In the present time, businesses from all around the world are faced with challenging environmental conditions. In the existing haziness regarding future business environment in terms of rising environmental uncertainty and deteriorating ecological health, firms are confronting severe challenges in achieving sustainability (Schaltegger et al., 2017; Castro, 2018). Similarly, increasing energy dependence among industries, commerce and households also played a dominant part in enhancing ecological pressures, thereby disrupt environmental quality. In response, firms are keen to adopt solutions for curtailing their energy intensity. In this regard, the importance of availing energy efficiency is considered eminent to fulfill organization's responsibility towards the environment (Pons et al., 2013). Firm's implementation for energy

efficiency can have both positive and negative consequences. On the one hand, it can support an organization's contribution to environmental sustainability by reducing its energy footprint; however, it can also alter the firm's operational performance.

Complying with augmented environmental concerns, many articles have investigated the importance of environmental management in numerous fields of marketing (Miles and Russell, 1997), finance (Hang et al., 2018), supply chain (Handfield et al., 2005), human resource (Jabbour and Santos, 2008), etc. The importance of environmental management has also been increasing in the field of accounting (Schaltegger, 2018). Firms often utilize management accounting in exploring environmental trends that challenge the prospect of sustainability (Ahnad and Lutz, 1989). The information obtains from the company's accounting systems

facilitates decision making (Mangaliso, 1995) and aids in gaining internal and external informational insights that strengthen a firm's competitiveness. Furthermore, accounting information systems are also useful in analyzing the monetary effects (returns and risks) of ecological features on businesses that helps to provide valuable information to investors, lenders and other monetary stakeholders (Bartolomeo et al., 2000).

In addition, rising environmental pressures, increasing regulations, fierce competition, and technological variations have amplified the uncertainty of the firm regarding external/environmental conditions. On the one hand, environmental uncertainty motivates managers performance. However, it can also bring adverse impact on firm operational and environmental performance in cases of negligence, rigidity, and absence of adaptability. Interest in performance attributes has always been the center of attention in business management. The augmented consideration in evaluating organizational performance by researchers, consultants and managers indicate the extensive pressure reflecting that firms have to adopt several measures to boost their performance (Hoque, 2004). The vitality of evaluating a firm's performance lies in identifying and highlighting the drivers of an organization's operational, social and environmental efficiency. The understanding regarding the firm's determinants of performance not only helps in achieving informational efficiency that supports decision making process and policies building but also aids in attaining financial and non-financial benefits that improve the firm's competencies.

Given the importance of performance attributes in the current environmental era, the current study aims to evaluate the role of accounting and environment in driving the firm's performance. Thus, the study is motivated to evaluate the specific relationship of energy efficiency (EEF), accounting information system efficiency (AIS) and environmental uncertainty (ENU) with business performance. The current study measures the empirical impact of the performance drivers on two vital domains of a firm's performance. Specifically, the authors seek to explore the effects of EEF, AIS, and ENU on the firm's operational performance (OPP). Furthermore, notice the enhanced environmental awareness and concerns in modern businesses, the study is also motivated to inspect the impact of EEF, AIS, and ENU on the firm's environmental performance (ENP).

The remaining examination is structured as below. After section one, the literature review and hypotheses to test are presented in section two. Later, section three defines the methodology of the study by mentioning information regarding data collection, sampling, statistical technique and construct measurements. Section four of the study reported empirical outcomes of the empirical analysis. Finally, section five concludes the study by summarizing results and implications.

2. LITERATURE REVIEW AND HYPOTHESES

Many empirical investigations have been carried out to analyze the association between environment and accounting. Among

the earlier work, Swamidass and Newell, (1987) inspected the critical role of environmental ambiguity in affecting organizational performance. Using the data of thirty-five firms, the authors confirmed the significant association of ENU in altering firm performance. Particularly, the findings suggested that ENU drove productional strategies that ultimately impact the organization's performance. Likewise, Gul and Chia, (1994) examined the connection of management accounting systems (MAS), environmental uncertainty and decentralization in enhancing performance. Using the data of Singaporean enterprises, the results found a significant contribution of the studied variables. In addition, the authors of the study interpreted that with augmented decentralization, MAS efficiency is more required to curtail environmental uncertainty and improve performance. Similarly, Chong and Chong, (1997) also examined the role of accounting for boosting performance under increased environmental uncertainty. Focusing on the performance of strategic business units (SBU), the authors aimed to find the contribution of MAS design and uncertainty in altering SBU performance. Studying the Australian firms, the results of the analysis suggested that managerial strategies and environmental uncertainty are significant to influence MAS that led to enhance SBU's performance.

Recently, Salim et al. (2018) analyzed the role of cost accounting in the presence of environmental uncertainty in affecting the company's performance. Using a sample of 123 enterprises, the authors established a significant role in cost accounting regarding material flow (CAMF) in influencing firm performance. In specific, the outcomes reported the positive impact of CAMF on organization's environmental as well as economic performance (Dawabsheh et al., 2019). The results, however, failed to find the significance of ENU in affecting CAMF in the sample. On the other hand, Yu et al., (2016) analyzed the association between competitor identification, ENV and business performance. Using the data of Taiwanese companies, the result of the investigation reported that ENU is a critical driver of a company's competitor identification (Haseeb et al., 2019a). In addition, the results supported the firm's identification of its competitor possessed a U-shaped association with an organization's performance. Similar results were reported in the examination of DeSarbo et al. (2005) for the countries of Japan, China and the United States.

Alternatively, Hoque, (2004) inspecting the contribution of ENU in influencing the use of management non-financial measures and firm performance; reported the insignificant effect of ENU for the case of Australian manufacturing firms. Similarly, in the domain of supply-chain procedures; Wong et al. (2011) and Fynes et al. (2004) scrutinized the relationship of environmental uncertainty in affecting firm operational performance (Jermsittiparsert et al., 2019). Analyzing the firms of Thailand and Ireland, respectively, the outcomes of both studies found the significant contribution of environmental uncertainty in altering a firm's performance. Similar results were found in the investigation of Badri et al. (2000) and Latan et al. (2018) in analyzing the firms of UAE and Indonesia respectively.

Linking uncertain environment with accounting information and performance nexus, Ajibolade et al. (2010) also examined the

link between MAS, ENU and organization performance. In doing so, the authors used the data of 144 manufacturing companies in Nigeria. The results of empirical analysis suggested that ENU have an interactional association with MAS design. In particular, the findings revealed that ENU moderated the relationship of MAS systems on firm performance in Nigeria. In another investigation, Soudani, (2012) connected the efficiency of AIS with the company's performance. In particular, the author aimed to examine the role AIS usefulness can in improving the firm's financial, managerial and overall performance. Using the data of seventy-four firms of UAE, the results of the study found that AIS efficiency is crucial to impact a firm's financial performance that led to increasing the organization's overall performance. On the other hand, the authors failed to identify the significant relationship of AIS in enhancing the firm's managerial performance.

In another study, Hammad et al. (2013) examined the role MAS, ENU, and performance. Using the sample of 200 hospitals in Egypt, the authors established a significant role of EVU and MAS in influencing managers performance. In specific, the outcomes reported the negative impact of ENU on MAS efficiency. Furthermore, the outcomes supported the presence of a positive association of MAS's scope and timeliness on managerial performance. Moreover, Agbejule (2005) also analyzed the nexus of accounting, environment, and performance. Utilizing the data of sixty-nine managers of Finland firms, the outcomes of the study found that MAS is vital to influencing an organization's performance under uncertain environment. Specifically, the findings concluded that higher uncertainty MAS brought a positive impact on performance (Ahmed et al., 2017). On the other hand, under low uncertainty in the environment, the impact of MAS on performance turned negative.

Similarly, energy is also regarded as an important attribute of a firm's growth. Utilizing firm-level data, Gözrig and Stephan, (2002) established the significant positive association of energy utilization with organizational performance. In addition, Chan, (2005) and Chan and Lam, (2003) also found that the adoption of ecologically driven methods and practices helped organizations to decline their energy dependence and curtail costs associated

with resources and energy consumption that can enhance firm's potentials for improved performance (Callaway, 2017; Haseeb et al., 2019b). On the other hand, Molina-Azorin et al., (2009) analyzed the nexus of ecological activities and the company's performance. Using the data of the hotel industry of Spain, the authors established that energy saving methods have a significant positive impact on firm performance.

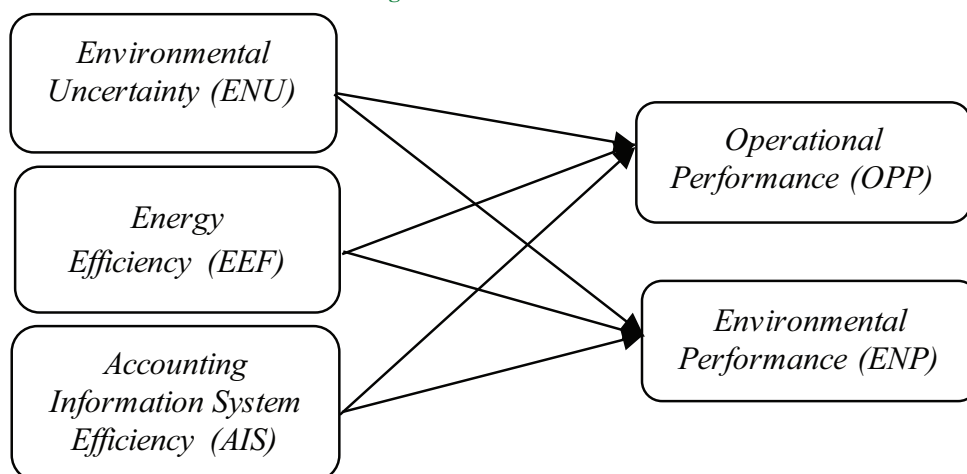
Moreover, Pons et al. (2013) also investigated the contribution of energy efficient skills and technologies in affecting a firm's performance. In doing so, the authors separately analyzed the impact of EEF on firms economic and environmental performance. Using the data of Spanish and Slovenian manufacturing firms, the results of the study suggested the significant positive impact of EEF on the organization's environmental performance. However, the study failed to find significant results regarding the link between EEF and the firm's economic performance. In addition, Boyd and Curtis, (2014) also examined the role of energy efficiency and management practices. Analyzing the data of developed countries of the US and UK, the outcomes of the study found support for the vital empirical link between management and energy efficiency. In specific, the result suggested that efficient management carried a spillover impact on energy efficiency and financial targets of the organizations. On the other hand, using several measures of environmental management, Pereira-Moliner et al. (2012) established that ecologically driven management practices have a significant positive influence on firm's financial performance.

In the light of existing literature on accounting systems, environmental uncertainty, and energy efficiency, the current study proposed the following hypotheses;

- H₁: ENU has a significant effect on the Company's OPP
- H₂: ENU has a significant effect on the Company's ENP
- H₃: EEF has a significant effect on the Company's OPP
- H₄: EEF has a significant effect on the Company's ENP
- H₅: AIS has a significant effect on the Company's OPP
- H₆: AIS has a significant effect on the Company's ENP

Figure 1, the conceptual model of the study is displayed.

Figure 1: Research model



3. METHODOLOGY

3.1. Data Collection and Sample Size

The step of data collection in the current research is completed by gathering information from the multinational firms of Indonesia. Furthermore, we select 78 distinctive multinational firms from a different sector of Indonesia. For quick and smooth data collection method, we make an understanding of our instrument into the English language and send to the selected different multinational firms of Indonesia. Accordingly, a whole of 445 survey questionnaires was discussed to utilize both on the hard copy and printed copy of the survey instrument. The strategy for information gathering acquired time of pretty much 9 months, 2 weeks and 11 days and got 400 responses with the reaction rate of 89.89%.

3.2. Measures of the Research Instrument

The current study examines the effect of environmental uncertainty, energy efficiency and accounting information system efficiency on operational and environmental performance in different multinational firms of Indonesia. So as to accomplish this reason, we explore the research model concentrated on previous studies, and the model is exhibited in Figure 1. The important features of the selected factors are clarified by using the Likert scale strategy from 1 (strongly disagree) to 5 (strongly agree). By and large, the present investigation utilizes five different factors. The factors utilized into this examination are the ENU, EEF, AIS efficiency, OPP and ENP. Moreover, the four items of ENU are received from the research of Agbejule, (2005). Furthermore, the four items of EEF are adopted from the earlier investigation of Ninlawan et al. (2010). The four things of AIS are grasped from the examination of Melnyk et al. (2003); Gholami et al. (2013). In addition, the present examination uses four items of OPP and ENP which are taken from the study of Zhu et al. (2013). In order to investigate the impact of environmental uncertainty, energy efficiency and accounting information system on operational and environmental performance in different multinational firms of Indonesia, the current study apply partial least square equation modelling to investigate the possible relationship among these variables.

4. DATA ANALYSIS AND DISCUSSION

In the current study, the information analysis is finished by utilizing two programming which is the SmartPLS Version 3.2.8 (Ringle et al., 2015) and Statistical Package for Social Sciences (Version-23). Final data used for the current examination is 377 after removing of univariate and multivariate anomalies. The strategy for identifying of univariate and multivariate anomalies are Z-test score and Mahalanobis Distance (D2) by utilizing SPSS (V-23) and remaining of the information analysis is done by applying SmartPLS. Indicated Table 1 is the structure and arrangement of the final responses of the gathered information used in this examination. Also, Table 2 clarify the mean and Pearson's Correlation of the factors used in the present examination. Additionally, to handle the issue of multicollinearity, the flow looks into applies to Hair et al. (2010) initiate that by a wide edge in Pearson's Correlation examination

Table 1: Descriptive statistics

Gender		Frequency	Percent
Valid	Female	160	42
	Male	217	58
	Total	377	100
Age			
	Valid		
	20-30 years	94	25
	31-40 years	164	44
	41-50 years	64	17
Working experience			
	Valid		
	1-5 years	86	23
	6-10 years	198	53
	11-15 years	51	14
Education			
	Valid		
	Undergraduate	97	26
	Graduate	235	62
	Post graduate	16	4
	Others	29	8
	Total	377	100

Source: Authors estimation

Table 2: Means and pearson correlations

Variables	Mean	ENU	EEF	AIS	OPP	ENP
ENU	4.034	-				
EEF	4.009	0.367**	-			
AIS	4.122	0.332**	0.273**	-		
OPP	4.234	0.352**	0.221**	0.319**	-	
ENP	3.887	0.282**	0.302**	0.328**	0.411**	-
n=377						

**Correlation is significant at the 0.01 level (2-tailed)

ought to underneath 0.90. Subsequently, affirm the absence of multicollinearity among the variables (Hair et al., 2013; Frooghi et al., 2015).

Furthermore, initially we talk about content validity, it is validated if the items utilizing in the information examination load with specific value in their definite factor in contrast with different items appeared in the framework, while inner constancy is confirmed if the estimation of Cronbach's alpha and composite reliability value found >0.7 (Hair et al., 2013; Waseem et al., 2013). Factor loadings and composite reliability values showed up in Table 3 which display that an enormous value of the items factor loading is more prominent than 0.7. Besides, these loadings appear in their individual parts which ensuring the internal consistency of the selected constructs.

Likewise, convergent validity explains that to what degree an item with respect to a particular factor built up and loaded to an abutting variable where they thought to be loaded (Mehmood and Najmi, 2017; Bubphapant, 2017). In this exploration, convergent validity is introduced by utilizing an average variance extracted (AVE) for each factor (Fornell and Larcker, 1981). They gave the benchmark of more basic than and showed up distinctively in connection to 0.5 for guaranteeing up to the convergent validity. The results of AVE in Table 3 is confirming the basic parameters.

Table 3: Measurement model results

Variables and items	Factor loadings	Cronbach's alpha	Composite reliability	AVE
Environmental uncertainty				
ENU1	0.953	0.924	0.874	0.602
ENU2	0.921			
ENU3	0.970			
ENU4	0.915			
Energy efficiency				
EEF1	0.931	0.893	0.853	0.663
EEF2	0.893			
EEF3	0.905			
EEF4	0.898			
Accounting information system efficiency				
AIS1	0.900	0.943	0.892	0.593
AIS2	0.877			
AIS3	0.935			
AIS4	0.847			
Operational performance				
OPP1	0.912	0.953	0.903	0.616
OPP2	0.868			
OPP3	0.816			
OPP4	0.868			
Environmental performance				
ENP1	0.888	0.883	0.889	0.573
ENP2	0.878			
ENP3	0.848			
ENP4	0.826			

Source: Authors Estimation. AVE: Average variance extracted

In further steps, discriminant legitimacy is uncovered as how much an item of a factor is discriminant and novel from other factors (Frooghi et al., 2015; Chang, 2017). According to Fornell and Larcker (1981), the discriminant is said to be pronounced if the AVE square root square is more than the pair-wise relationship of the latent factor. The outcomes showed up in Table 4, bold and italic values are the square root of AVE which is more than the off-diagonal to estimates which are the pair-wise relationship of each factor (which are ENU, EEF, AIS, OPP, and ENP). In addition, Table 5 demonstrates the factor loadings of a different and separate factor, in this way, articulating the cut-off limit. So also, the discriminant legitimacy is additionally granted if the Hetro Trait and Mono Trait parameter are lower than 0.85 as proposed by Henseler et al. (2015). The results in Table 6 revealed that all factors have Discriminant authenticity.

In the final step, we associated a partial least square framework with investigating the model and theory testing which displaying path coefficients, t-statistics, and probability value. As appeared by Chin (1998) proposal, a bootstrapping technique using 1000 sub-test was associated with affirming the quantifiable basic evaluations of the considerable number of variables. Table 7 reveals beta coefficients, t-measurements, and their probability value with the remarks about the theory testing.

The consequences of the partial least square structural equation modelling are introduced in Table 7. It gives the results of relapse path coefficient, t-measurements, likelihood values (P values) and the comments identified with the hypothesis path. In general, the outcomes proposed that every single chosen variable have a noteworthy effect on environmental and Operational performance in different multinational firms in Indonesia. In addition, the

Table 4: Discriminant validity Fornell-Larcker criterion

Variables	ENU	EEF	AIS	OPP	ENP
ENU	0.775				
EEF	0.221	0.814			
AIS	0.302	0.411	0.771		
OPP	0.311	0.392	0.444	0.785	
ENP	0.437	0.421	0.412	0.347	0.757

Source: Authors estimation

results of the PLS-SEM affirm that operational performance ($\beta = 0.324$, $P < 0.000$) and environmental performance ($\beta = 0.302$, $P < 0.000$) have emphatically and negatively affected by environmental uncertainty henceforth asserting H_1 and H_2 . The results of partial least square equation modelling displaying likewise demonstrate that operational performance ($\beta = 0.435$, $P < 0.000$) and environmental performance ($\beta = 0.421$, $P < 0.000$) have positive and significant affected by the energy efficiency, hence, affirming H_3 and H_4 . At last, the outcomes likewise confirmed that operational performance ($\beta = 0.331$, $P < 0.000$) and environmental performance ($\beta = 0.289$, $P < 0.000$) have altogether and emphatically influenced by accounting information system efficiency henceforth supporting H_5 and H_6 . Generally speaking, the results of partial least square modelling affirm that the three components, i.e. environmental uncertainty, energy efficiency, and accounting information system efficiency are the huge supporter of operational performance and environmental performance in different multinational firms in Indonesia. Moreover, the results further suggested that the more the environmental uncertainty, the more difficult for the organization to perform which ultimately affect the environmental performance. Along with this, energy efficiency and accounting information system efficient can help the multinational firms to improve their operational and environmental performance.

Table 5: Results of loadings and cross loadings

Variables	ENU	EEF	AIS	OPP	ENP
Environmental uncertainty	0.953	0.329	0.458	0.223	0.465
	0.921	0.537	0.349	0.326	0.394
	0.970	0.137	0.256	0.295	0.441
	0.915	0.455	0.440	0.353	0.480
Energy efficiency	0.250	0.931	0.560	0.256	0.339
	0.218	0.893	0.340	0.524	0.288
	0.134	0.905	0.248	0.459	0.322
	0.326	0.898	0.282	0.343	0.416
Accounting information system efficiency	0.297	0.347	0.900	0.267	0.368
	0.470	0.222	0.877	0.291	0.473
	0.231	0.222	0.935	0.268	0.416
	0.430	0.530	0.847	0.186	0.362
Operational performance	0.347	0.374	0.232	0.912	0.375
	0.427	0.474	0.470	0.868	0.531
	0.468	0.579	0.437	0.816	0.375
	0.315	0.433	0.363	0.868	0.324
Environmental performance	0.510	0.304	0.257	0.353	0.888
	0.366	0.247	0.375	0.438	0.878
	0.427	0.364	0.563	0.406	0.848
	0.412	0.571	0.266	0.464	0.826

Source: Authors estimation

Table 6: Results of HTMT ratio of correlations

Variables	ENU	EEF	AIS	OPP	ENP
ENU					
EEF	0.602				
AIS	0.582	0.489			
OPP	0.417	0.602	0.493		
ENP	0.523	0.663	0.379	0.611	

Source: Authors estimation

Table 7: Results of path coefficients

Hypothesized path	Path coefficient	t-statistics	P value	Remarks
OPP←ENU	-0.324	-4.325	0.000	Supported
ENP←ENU	-0.302	-6.355	0.000	Supported
OPP←EEF	0.435	4.093	0.000	Supported
ENP←EEF	0.421	4.414	0.000	Supported
OPP←AIS	0.331	3.586	0.000	Supported
ENP←AIS	0.289	9.356	0.000	Supported

Level of significance (5% i.e., 0.050). Source: Authors' Estimation

5. CONCLUSION

In the present time, businesses from all around the world are faced with challenging environmental conditions. In the existing haziness regarding future business environment in terms of rising environmental uncertainty and deteriorating ecological health, firms are confronting severe challenges in achieving sustainability. Similarly, increasing energy dependence among industries, commerce and households also played a dominant part in enhancing ecological pressures, thereby disrupt environmental quality. Also, firms often utilize management accounting in exploring environmental trends that challenge the prospect of sustainability. The information obtains from the company's accounting systems facilitates decision making and aids in gaining internal and external informational insights that strengthen a firm's competitiveness. Furthermore, accounting information systems are also useful in analyzing the monetary effects (returns and risks) of

ecological features on businesses that helps to provide valuable information to investors, lenders and other monetary stakeholders.

In addition, rising environmental pressures, increasing regulations, fierce competition, and technological variations have amplified the uncertainty of the firm regarding external/environmental conditions. On the one hand, environmental uncertainty motivates managers performance. However, it can also bring adverse impact on firm operational and environmental performance in cases of negligence, rigidity, and absence of adaptability. Interest in performance attributes has always been the center of attention in business management. Given the importance of performance attributes in the current environmental era, the current study aims to evaluate the role of accounting and environment in driving a firm's performance. Thus, the study is motivated to evaluate the specific relationship of energy efficiency, accounting information system efficiency and environmental uncertainty with business performance. The current study measures the empirical impact of the performance drivers on two vital domains of a firm's performance. The results of PLS-SEM confirm that energy efficiency and accounting information system efficiency have a positive and significant impact on operational and environmental performance. Moreover, the results further suggested that environmental uncertainty have a negative and significant impact on operational and environmental performance in multinational firms of Indonesia.

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