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Role of Green Supply Chain Management in embolden Competitiveness and Performance: Evidence from Indonesian Organizations

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Abstract--The current research investigates the empirical debate that impact of green supply chain management on competitiveness and performance. For doing this purpose, the current study divided performance into three sub-categories which are environmental performance, economic performance, and operational performance. The current study is conducted in the manufacturing industry in Indonesia. The results of structural equation modeling confirm that green purchasing, green information system, and eco-design have a positive and significant impact on competitiveness. Moreover, the results further suggested that competitiveness has also positively and significantly impact on environmental performance, economic performance and operational performance. The results further suggested that competitiveness is highly positive and significant impact on environmental performance followed by operational performance and economic performance. Therefore, it is recommended that competitiveness is the main factor in order to enhance and strengthen environmental and operational performance.

Keywords*: Green supply chain, environmental performance, operational performance, and competitiveness.*

1.   Introduction

Sustainable development has become an exceedingly debated topic in the growth process of businesses and economies around the globe. Ecological issues instigating from domestic, native and worldwide ramifications of air emanations, sturdy waste transfer along with the utilization of natural resources have been observed, monitored and discussed for the curtailing the adverse corporate practices to improve organizational & ecological development. In this regard, the role of the supply chain is crucial to ensure the process of sustainable growth [22]. Therefore, from past decade, business around the globe have been eager to adopt, implement & expertise the process of the green supply chain management (henceforth GSM) in order to fulfil their due part in environmental sustainability.

The domain of GSM has experienced severe attention in the East Asian region [19]. In addition, the awareness regarding climate change & sustainable development through numerous stakeholders & regulatory authorities have also been expended, especially in Indonesian organization, for playing their part in lightening up the natural weights of the environment [27]. Also the fact that due to the presence of economic globalization, firms are liable for executing green practices as a result of the pressure imposed by both local & international customers & partners [5].

The exceeding motivation behind the implementation of green supply management has many reasons. Other than the major cause of alleviating the environmental burden, the adoption of GSM also encompasses the protection from shrinking stock of raw materials, enormous increase in waste locations & below average product qualities emerged as a result of polluted surroundings [20]. On the other h&, the element of corporate competitiveness also encourages & strengthen the prospect of the GSM by the organizations to obtain eco-friendly competitive advantages (Chung & Wee, 2008). In other words, the improved performance through the adoption of GSM practices enables the businesses to augment their competitiveness that also has the potentials of enhances economic performance of the firm [19].

The literature from the last two decades has begun to investigate the numerous aspects of the GSM. It involves the studies regarding greening the product designs [22], greening the procedure design [13], green buying [18], suppliers' assimilation in green supply management [28], cleaner systems of production [7] & logistics network layouts [12]. More recently, the literature of GSM has begun to witness the shift of interest towards determining the competitiveness of greening the process of the supply chain. In this regard, few studies investigate the advantages of adopting a GSM to improve their effectiveness in competitive markets [4] and [6]. Nevertheless, the role of GSM in enhancing a firm's competitiveness to date is still relatively ambiguous & far from satisfactory [17].

Therefore, the objective of the present study is to examine the role of GSM in influencing a firm's competitiveness. In this regard, the measures of GSM involve the aspects of eco-design, green purchasing & green information systems. In addition, the objective of the current study extends to further analyse the overall

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impact of a firm's competitiveness through the GSM in augmenting organization performance. Also, the performance is measured not only through a single measure but through the multiple facet representation. It includes environmental performance, operational performance, & economic performance.

2. Literature Review

Keeping in mind the emergence, importance, environmental usefulness & global emphasis on GSM, many studies investigated the numerous domains & prospects of the GSM. In this context, Zhu et al. (2005) examine the adoption process of GSM to influence ecological modernization in China. In addition, the study further strives to analyse the potentials of Chinese producers' recognition towards internal environmental orientation & its link with the adoption of GSM. For that purpose, the study examines the contribution of regulatory pressure to mediate the aforementioned aspects. The findings of the study conclude that modernization along with regulatory pressure does play a critical role in GSM implementation in Chinese firms.

Likewise, [19] study the role of GSM in affecting organizational competitiveness & economic performance of South East Asia. For that purpose, the study examines the three core process of GSM including greening in-bound, greening out-bound & greening production processes to influence competitiveness leading to economic performance. The outcomes of the study establish that the inbound & production functions of the GSM are significant to affect the outbound effects along with competitiveness leading to economic performance. On the other side, [16] examine the association of GSM with internal determinants of organizations to influence the success of an effective GSM. The study sampled Chinese organizations to analyse the role of internal training in enhancing the efficiency of the GSM. The outcomes of the study establish that continuous programs of internal training do play a significant role in improving the prospect of the GSM.

In the United States, [9] analyse the contribution of GSM in enhancing the performance of the 159 organizations. The study applied structural equation modeling to examine the impact of six GSM practices including internal environmental management, eco-design, green information systems, cooperation with customers, investment recovery & green purchasing on the three core measures of organizational performance, i.e. economic performance, environmental performance & operational performance. The findings of the study establish that the implementation of green supply management tends to enhance environmental & economic performance that further lead to affect the operational performance. The study further operational performance is a substantial indicator of improved organizational performance.

For the Chinese automobile industry, [24] inspect the overview of green supply management & performance in eighty-nine organizations of China. The findings of the study revealed that the process of green supply management helps to improve the environmental & organizational performance of the sampled organizations. The study, however, failed to find the impact of the GSM

to influence the economic performance of the Chinese automobile companies. Similarly, [15] also analyses the GSM's impact on economic performance. The findings of the study confirm the vital contribution of GSM in influencing a firm's economic performance.

Breaking down GSM into internal & external aspects, [26] examine the Institutional antecedents & performance effects of GSM. The study sampled 396 organizations from the manufacturing industry of China. The outcomes of the investigation establish that internal green supply practices do not affect economic performance. On the other h&, external green supply practices also happen to support economic performance partially. However, the study concludes that both internal & external practices of green practices are significant to influence environmental & operational performance that further lead to improving economic performance. [1] analyse the role of GSM in improving the process of a company's supply chain performance. The study sampled the automobile enterprises of Portugal. The results of the study establish that GSM practices are significant to influence the quality & performance of the Portuguese automobile industry.

[4] also analyze the role of environmental orientation on the performance of 194 organizations in China. In doing so, the study aims to examine the mediating effect of GSM measured by green purchase, investment recovery, & customer co-operation. Also, the author inspects the role of competitive intensity to moderate the effect of green supply management on corporate performance. The results of the study conclude that GSM does mediate the impact of environmental orientation on performance. The moderation effects of competitive intensity are also found to significantly influence the association of GSM & corporate performance.

[11] inspect the role of GSM to influence performance. The methodology of the study emphasizes on case studies & literary work to gather the critical aspects of performance measurements in GSM practices. The study concludes that along with the internal & corporate-based supply chain practices, ecological & inter-organizational factors are the crucial effect the process of GSM & performance. [23] also examine the operational practice & performance of GSM in 186 Chinese organizations. The study focus to analyse the drivers of GSM practices to influence the performance of Chines firms. The results of the study establish that the understanding & recognition of organization towards environmental stability are substantial to influence the adoption of GSM practices, & the effect of the GSM is crucial to enhance the economic & environmental performance in the sampled organizations of the country.

3. Methodology

The current study has collected data from managers at higher or middle management levels. We focused that middle-level managers, for instance, those in a purchasing department can simplify incremental adoption of environmental practices, which is similar to our outcomes from a broad business talk with over fifty companies prior to launching out survey research. Moreover, a positive

connection is found between middle managers' perceptions of GSM & environmental proactivity [2] and [3]. We then arranged our inspection by using convenience sampling during training workshops. A total of 217 surveys question were distributed to manufacturing supply chain middle level managers. After removing the blank, & incomplete survey questionnaire, we found at a final sample size of 198 unique manager responses.

The questionnaire incorporated 7 variables for a study that includes: green purchasing (GP), green information system (GIS), eco-design (ED), competitiveness (COM), environmental performance (ERP), economic performance (ECP) & operational performance (OP). The adopted questionnaire involves attributes of these variables based on prior research & is designed through Likert scale from 1= Strongly Disagree to 5= Strongly Agree. Questions are taken from prior researches like green purchase (GP) from Zhu et al. (2013) which showed the internal consistency coefficient of the measuring scale i.e. Cronbach Alpha of 0.84; green information system (GIS) from Esty & Wintson, (2006) whose Cronbach Alpha is 0.89. Eco-design (ED) from [26] with Cronbach Alpha of 0.90. The Cronbach Alpha value of that is found to be 0.81 for competitiveness (COM) where the items are collected from Rao & Holt, (2005). Questions are taken for environmental performance (ERP), economic performance (ECP) & operational performance (OP) from [26] which showed the internal consistency coefficient of the measuring scale i.e. Cronbach Alpha of 0.81, 0.88 & 0.85 respectively.
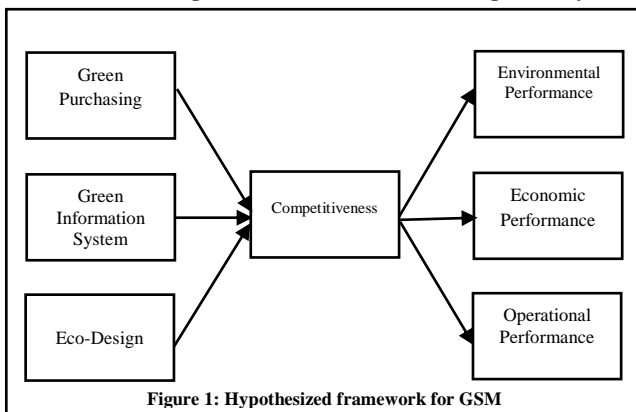

Figure 1: Hypothesized framework for GSM

Based on the comprehensive review of the literature, the present study aims to test the following hypothesis model.

Ho_1: *Green purchasing has a positive & significant impact on Firm Competitiveness*
Ho_2: *Green Information system has a positive & significant impact on Firm Competitiveness*
Ho_3: *Eco-Design has a positive & significant impact on Firm Competitiveness*
Ho_4: *Firms Competitiveness has a positive & significant impact on Environmental Performance*
Ho_5: *Firms Competitiveness has a positive & significant impact on Economic Performance*
Ho_6: *Firms Competitiveness has a positive & significant impact on Operational Performance*

4. Empirical Analysis

The empirical analysis was examined by using software named as Statistical packages for Social Sciences SPSS 21 & Analysis moment of Structure AMOS 21 package with data size of n=202. Shown in Table-1 is the structure of the sample used in current study. In the composition of the data we have company classification, age & working experience. In company classification we have 5 different types of companies which includes cement companies, pharmaceutical companies, automobile & food & beverages companies. We have collected 88 responses from cement company (43.56%), 75 valid responses from pharmaceutical company (37.13%), 11 valid responses from automobile company (5.45%) & 28 valid responses from food & beverages companies (13.86%) of the total collected sample. In the age bracket, we have total 85 valid responses which are between 20-30 years old (42.08%), 78 valid responses which are 31-40 years old (38.61%), 38 responses from age between 41-50 years old (18.81%) & one 1 valid response from the age above 51 years old (0.50%) of the total collected sample. On the & h&, we have valid response of 43 respondents (21.29%) which have experience more than 1-5 years, 49 valid responses (24.26%) which have experience more than 6-10 years, 56 valid responses (27.72%) which have experience more than 11-15 years & 54 valid responses (26.73%) which have experience more than 15 years out of total sample collected.

Table 1: Composition of the Data

Company Classification			
		Frequency	Percent
Valid	Cement	88	43.56
	Pharmaceuticals	75	37.13
	Automobiles	11	5.45
	Food & Beverages	28	13.86
	Total	202	100.00
Age			
		Frequency	Percent
Valid	20-30 years	85	42.08
	31-40 years	78	38.61
	41-50 years	38	18.81
	51 & above	1	.50
	Total	202	100.00
Working Experience			
		Frequency	Percent
Valid	1-5 years	43	21.29
	6-10 years	49	24.26
	15-11 years	56	27.72
	More than 15 years	54	26.73
	Total	202	100.00

Table 2 shows the correlation between the seven constructs of the current study. Empirical investigation

was started prior inspection for the problem of multicollinearity. With the objective to solve the issue of multicollinearity among independent, [10] explained that the problem of multicollinearity occurs in the study if Pearson's R-value is more than 0.90. The maximum Pearson's correlation value is between green information system & competitiveness i.e. 0.82 which still is less than 0.9, proposing no problem of multicollinearity exist among the constructs [10].

Table 2: Pearson Correlations

Correlations							
	GP	GIS	ED	COM	ERP	ECP	OP
GP	1						
GIS	.226	1					
ED	.187	.605	1				
COM	.209	.818	.792	1			
ERP	.142	.746	.780	.711	1		
ECP	.223	.465	.695	.563	0.65	1	
OP	.543	.157	.257	.781	0.45	0.57	1

4.1 Exploratory Factor Analysis

The results of Table 3 confirm the model fitness of exploratory factor analysis. The value of KMO is 0.887 which is greater than .700 as suggested by [10]. Also, the significance value of Bartlett's test is less than 0.050. The results of KMO & Bartlett's test confirm that the collected sample is enough for making the factor analysis.

Table 3: KMO & Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.887
Bartlett's Test of Sphericity	Approx. Chi-Square	2712.046
	Df	276
	Sig.	.000

Table 4 explains the results of exploratory factor analysis in which we have seven variable & every variable has four items in it. In table 4 we have factor loadings of 28 items with the factor loading more than 0.60. In green purchasing variable we have 4 item with the minimum factor loading value of 0.787 & maximum factor loading value of 0.810. Similarly, green information system has 4 value with minimum 0.704 & 0.742 maximum facto loading value. Eco-design have also 4 items with factor loading from 0.687 to 0.870. Competitiveness has 4 item with the factor loading of minimum value 0.679 & maximum value of 0.775. Whereas, the performance variables also have 4 items in their latent variables with the minimum factor loading value of 0.687 to 0.729 for environmental performance, 0.654 to 0.707 for economic performance & 0.610 to 0.695 for operational performance. The results of table 4 confirm that minimum factor loading is greater than 0.55 which are considered excellent good [21]. The subsequent explanation displayed in table 4 doesn't display any cross loading between the items signifying that there is no issue of discriminant validity among variables.

Table 4: Results of Exploratory Factor Analysis

		GP	GIS	ED	COM	ERP	ECP	OP
EV		7.6	2.6	2.3	1.7	1.4	1.2	1.0
%		14.5	12.8	11.2	10.8	10.8	9.6	9.2
C %		14	27	38	49	60	69	79
GP	GP1	.81						
	GP2	.80						
	GP3	.80						
	GP4	.78						
GIS	GIS1		.74					
	GIS2		.73					
	GIS3		.71					
	GIS4		.70					
ED	ED1			.87				
	ED2			.78				
	ED3			.74				
	ED4			.68				
COM	COM1				.77			
	COM2				.72			
	COM3				.69			
	COM4				.67			
ERP	ERP1					.72		
	ERP2					.71		
	ERP3					.70		
	ERP4					.68		
ECP	ECP1						.70	
	ECP2						.70	
	ECP3						.67	
	ECP4						.65	
OP	OP1							.69
	OP2							.67
	OP3							.65
	OP4							.61

Extraction Method: (PCA) Principal Component Analysis
a. Rotation joined in 9 repetitions

4.2 Confirmatory Factor Analysis

The current study executed Confirmatory Factor Analysis (CFA) with twenty-eight absolute items that indicated seven factors i.e., green purchasing (GP), green information system (GIS), eco-design (ED, competitiveness (COM), environmental performance (ERP), economic performance (ECP) & operational performance (OP). The CFA framework analyzes the association among the measured & latent factors (Byrne, 2012). The effectiveness of CFA dimension framework base on the valuation of its framework wellness. The earlier studies have consent on giving a grouping of indices as an alternative of focusing on any particular table for evaluating framework. [14], [28]-[33] intensely recommended the grouping of the Chi-Square test, the Comparative Fit Index, the Root Mean Square Error of Approximation (RMSEA) & Standardized Root Mean

Square Residual (SRMR). These keys are ideal upon various tables when they are mostly unaffected by data size, parameter estimates & misleading. Following [14] suggestion, Table 3 displays the goodness of fit table for our ultimate theorized framework.

Table 5: CFA Model Fit Indices

Indices	Final Measurement Model
χ^2(df)	2113.358 (1460)***
CMIN/df	1.448
CFI	0.938
RMSEA (P-Close)	0.047 (0.853)
SRMR	0.0435

Inclusively, the results of goodness fit tables recommended that our framework explains the sample very sound. In the concluding Measurement framework, Chi-Square is representing the dissimilarity among the actual model & the hypothesized framework. In our case, the value of CMIN/df is 1.44 & explains the goodness of fit standard. Additionally, in associating smallest discrepancy outcome with further classy suitable indices, our (CFI=0.94) is equivalent to the outstanding framework suitableness level & greater than the old range of 0.90. Our (SRMR=0.04) is also significantly lesser than the 0.08 value that is measured satisfactory for representing model fitness.

4.3 Structural Equation Modelling

Table 6: SEM Hypothesis Testing

	Path	Beta	C.R	Sig	Status
H1	COM ← GP	0.40	-1.83	0.06	Supported
H2	COM ← GIS	0.31	5.97	***	Supported
H3	COM ← ED	0.25	3.67	***	Supported
H4	ERP ← COM	0.39	2.46	***	Supported
H5	ECP ← COM	0.09	2.85	***	Supported
H6	OP ← COM	0.17	2.30	0.02	Supported
R-Square (COM)	**0.563**				
R-Square (ERP)	**0.325**				
R-Square (ECP)	**0.283**				
R-Square (OP)	**0.473**				

The results of structural equation modelling are shown in table 6. This table contains beta coefficient value, standard errors, t-statistics (critical ratios) & significance value. Also, it explains the R-square value which means how much variance of dependent variables is explain by the help of independent variables. The regression coefficient model diagram is displayed in figure 2. The results suggest that all variables have a positive & significant impact on competitiveness & then competitiveness have a significant & positive impact on economic, environmental & operational performance. The outcomes proposed the positive significant impact of green purchasing (GP) (B= 0.406; p < 0.060), green information system (GIS) (B=

0.312; p < 0.000) & eco-design (ED) (B= 0.257; p<0.000) in explaining competitiveness (COM), whereas the significant positive impact of competitiveness (COM) on environmental performance (ERP) (B= 0.394; p < 0.000), economic performance (ECP) (B= 0.098; p<0.000) & operational performance (OP) (B= 0.173; p <0.021) in describing performance factor thus confirming hypotheses H1, H2, H3, H4, H5 & H6. The model explains 56.32% of the variation in competitiveness (COM), 32.50% of the variation in environmental performance (ERP), 28.3% of the variation in competitiveness (ECP) & 47.30% of the variation in operational performance (OP).
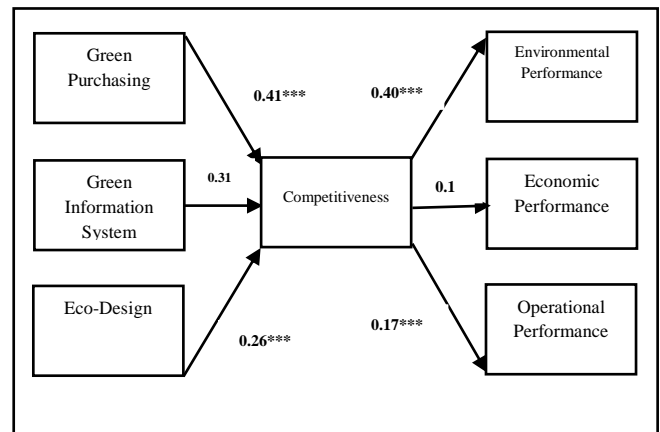
Figure 2: Research model with coefficient values

Overall, the current research has expressed 6 assumptions, out of which all are statistically proved by our collected sample. Showed in Figure 2 are the empirical outcomes of our research hypotheses.

5. Conclusion

The current research investigates the empirical debate that impact of GSM on competitiveness & performance. For doing this purpose, the current study divided performance into three sub-categories which are environmental performance, economic performance, & operational performance. The current study is conducted in the manufacturing industry in Indonesia. The results of structural equation modelling confirm that green purchasing, green information system, & eco-design have a positive & significant impact on competitiveness. Moreover, the results further suggested that competitiveness has also positively & significantly impact on environmental performance, economic performance & operational performance.

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