

Exploring the Nexus between the Environmental Investment, Environmental Performance, and the Proactive Environmental Strategy in a Supply Chain

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Abstract--- The main objective of the current research is to answer the following questions. What role is played by environmental investments in the association between environmentally proactive strategies and environmental performance in supply chain? And in what way the adoption and implementation of environmentally proactive strategies is affected by organizational commitment and customer pressure in the supply chain. The research does not focus on analyzing the variables enabling the occurrence of environmental practices rather it is based on practices, which are environmentally sound. It has been suggested by the previous research studies that the main factors are organizational commitment and customer pressure. The study has used questionnaire adapted from the prior studies to collect the data. The SEM-PLS is used to analyses the collected data. Due to limited research available on the association of corporate environmental practices and supply chains specific to the emerging countries, the data has been collected in the manufacturing industry of Indonesia. The findings of the study have been discussed along with limitations. The research also gives implications for future.

Keywords--- Supply Chain, Proactive Environmental Strategy, Environmental investment, Indonesia

1. Introduction

With the increase in awareness regarding change in climate and scarcity of natural resources, firms have come across a new environment that is competitive. Firms have to incorporate environmental policies to satisfy the stakeholders. In this way, customer base can be enhanced by the firms [11]. Firms are influenced to include environmental concerns in their organizational policies to comply with the regulations and legalities set by the government as well. In this way, less damage is incurred to the environment. The issue pertaining to environmental regulation is growing and the motives behind the issue are changing as well. It has become a necessity for the firms to show concern towards the environment and adopt strategies, which are proactive to the surroundings complying with regulations. It is the pressure of business customers, stakeholders, suppliers and environmentally aware consumers to the firm for working on environmental issues. The process of adhering to the environmental strategies, internal mechanisms play a role in fostering it along with the external pressure. Firms, which are motivated to lead, adopt strategies for enhancing their

performance against the environmental issues and achieve competitive advantage [3].

Firms aim at improving their environmental performance by implementing strategies, which are proactive to the environment [27]. However, it is under debate whether by adopting environmental proactive strategies, firms are able to achieve better performance or not [32]. Environmental investment is a key variable that is omitted from the relationship of environmental strategies and improved performance. It is suggested by the Contingency theory that performance analysis requires the development and implementation of the strategy [4]. Environmental investment can transform the environmental strategy into actions. Limited research exists in literature, which focuses on the association between environmental investments, management of environment and improved performance. It has been suggested by some previous studies that increase in strategies concerning to the environment does not result in investing in the environmental issues always [6]. The reason for environmental strategies not resulting in improved environmental performance can be explained by this research study aims at the identified research gap by incorporating the role of environmental investments as a mediating factor.

The environmental investments can be internal or external. These can take be the investments in relation with the suppliers or any other external party. The strategies, which are environmentally proactive, are complicated processes from social aspect and need investment in the integration of suppliers [1]. The products of the buying firm are directly influenced by the suppliers 'environmental performance. There is need for awareness about the environment and consistent behavior of firms in formulating environmental capabilities [41]. When investments are made in collaboration with the suppliers, this may include joint sessions for solving problems, formulating goals, sharing information, equipment sharing and evaluation of suppliers [43]. The environmental performance of a firm can be affected by external investments as mentioned earlier.

According to Han & Hyun, [24] the different and varying strategies of firms related to the environment within the similar industry can be explained by the organizational commitment. The effects of internal

and external factors can be contrasted by the analysis of organizational commitment, which lead to proactive environmental strategy. Increased amount of research is available on the association between supply chain management and environmental management, which is analyzed under the key concept of closed loop supply chains and green supply chain management (GSCM) [35, 15].

2. Hypothesis Development

2.1 Relation between Environmental Investments, Pro-activeness and Environmental Performance

The responsiveness of a firm to the external environmental issues is determined through a set of policies, plans or objectives. These are referred as environmental strategies [10]. Several strategic options are available to a company when it aims at responding to an environmental problem [9]. It is considered sufficient by some firms to fulfill the laws and environmental regulations when it is required. However, some firms adopt a strategic way and work on environmentally proactive strategies. Different types of strategies have been specified by literature based on the continuum of proactive-reactive [44].

Decrease in the use of material, reduction of waste and energy consumption can lead to lower environmental impact by a firm. This is referred as Environmental Performance. Use of environmentally proactive strategies usually results in better environmental performance for the companies [20]. A number of firms have moved to the use of proactive management of environment in the journey towards achieving competitive edge. It has been argued by [19] that strategic resources, competitive edge and efficiency are achieved by a firm through a proactive management of the environment. The association between environmental performance and proactive strategies can be confused by another issue, the way strategy is defined. According to Yang et al [42] strategy formulation and implementation can be included in a single construct. However, variable such as emissions of less toxic chemicals can be included as well [39]. According to Lai et al, [31] a limited understanding of association between implementation of technologies, environmental management and performance outcomes is available.

From a general aspect, there is need for actions to be taken for achieving improved performance through strategies [17]. A high financial performance is not reflected by a cost efficiency of a firm. There is need for a firm to reduce its costs across the supply chain, improve certain areas and invest time as well as make efforts to analyze its costs. In the similar way, it can be said that environmental investments is the missing relation in the relation of environmentally proactive strategies and environmental performance. This can support the firm in achieving its set objectives and improved performance.

There is an association between the internal and external investments made by a firm. It has been suggested by several studies that external investments improves the internal ones [38]. According to Ağan et al, [1] when activities are done in collaboration with the suppliers, it may not result in the prevention or reduction of pollution directly in the purchasing firm rather it does in the suppliers. The internal and external investments are treated differently in this research study. However, distinct facets of a higher order constructs are presented in the related dimensions. The model complexity is reduced through use of higher order constructs and it gives theoretical clarity. Moreover, due to the use of environmental investments as mediator the two concepts are combined in a second-order latent construct. Keeping in consideration the above notions, the following research hypotheses have been developed:

Hypothesis 1: Environmental investment has significant impact on the environmental performance.

Hypothesis 2: Proactive Environmental Strategy has significant impact on the Environmental Investments

Hypothesis 3: Proactive Environmental Strategy has significant impact on the Environmental performance

2.2 Customer Pressure

The requirements made by the end customers regarding the environmental issues are referred as Customer Pressure. Customers are aware of the environmental issues and they demand the

incorporation of policies in product development, which have low or no impact on the environment. The organizational power or position determines the demands and threats by its different stakeholders in relation to the environmental concerns [12]. A major stake is owned by the customers when it comes to affect the environmental strategies of a firm. They exert pressure, which is non-regulatory but can have a major influence on the management or position of the company. Companies are influenced to reduce their negative impact on the natural environment because of demands by the customers. The rise of 'green consumer' is another source of pressure for the firms to reduce their environmental impact. The business-to-business customers also make demands for the products to be environmentally safe by keeping a check of the manufacturing process and materials used in the production. In this way, end-customers are not the only one influencing business strategies.

According to Yu et al, [21] one of the key determinants of an environmental plan developed by a firm is customer pressure. The degree of adoption of environmental strategies by any firm is reflected by the pressure of its customers. Several researchers have emphasized on the relation of customer pressure with the proactive environmental strategy [21]. Firms are influenced to adopt a proactive environmental strategy through customer pressure. According to the research conducted by Calle et al, [7] there is no significant relation between environmental proactiveness and customer pressure. Most of the research studies have defined customer pressure as the exertion from the industrial or business customers rather than the usual customers. However, a clear difference has been made among the two by some studies. This research study does not makes a difference among the industrial and end customers. Both types of customers have been incorporate in sample without differentiation.

The relative importance of implementing a proactive strategy for environmental investments can be cleared by making comparison of direct and indirect effects. The following research hypotheses have been developed:

Hypothesis 4: Customer pressure has significant impact on the environmental investment.

Hypothesis 5: Customer pressure has significant impact on the environmental investment.

Hypothesis 6: Customer pressure has significant impact on the Proactive Environmental Strategies.

2.3 Organizational Commitment

It has been suggested by the literature on resource-based view that a crucial role is played by organizational capabilities in the implementation of environmental strategies by a firm and its impact on environmental performance. The organizational capabilities include resources, skills, internal and external factors, competency, etc. [2, 26]. According to Flammer and Kacperczyk, [19], proactive environmental strategies can be implemented easily when organizations have greater resources and higher capabilities.

Several studies have highlighted organizational commitment among all these resources. When employees and managers of a firm are willing to get involved in the management of environmental issues and reduce their impact, it is referred as organizational commitment. According to Flammer and Kacperczyk, [19] the use of different strategies by firms working within a similar industry can be explained by their level of organizational commitment. The use of proactive environmental strategies reflects high level of organizational commitment by the managers and employees of an organization. The perception, attitude and commitment of top management of an organization towards the environment are also regarded as organizational commitment. Several studies have analyzed the relation between the support of top management and proactive environmental strategies. The relation between commitment of top management and formulation of proactive environmental strategies has been explained by the two arguments. The first argument relates to the support provided by the major person for providing resources for the implementation of environmental practices. When the main person provides support, it becomes easier to implement environmental strategies. The second argument is related to the level of association or collaboration among different departments concerning issues of environment. When

there is good coordination among the departments, it becomes easier to implement initiatives.

The commitment of top management is not the only required thing. However, the commitment of employees matter as well. In order to implement a proactive strategy towards environment, there is need for the cross-functional integration of the firm and commitment of its employees. The change in organizational culture can be required by the proactive environmental strategies. The proactive strategies demand innovation. The involvement of organizational members improves the rate of implementation of such strategies [15]. In a research study conducted by Carter and Rogers, [8] the issue was analyzed from the aspect of innovation. It was found that in the process of implementing such strategies, the support of employees and management play a crucial role. This is particular for proactive environmental systems. Scholars and researchers have suggested that the role of lower level management, involvement of employees is also required along with the commitment of top management in the process of implementing environmental initiatives. The focus of this research study is on the organizational commitment rather than the support of top management rather than the support of top management only, this act as enabling factors in the adoption and implementation of environmentally proactive strategies.

Based on the literature findings, the following research hypothesis has been developed:

Hypothesis 7: Organizational commitment has significant impact on the environmental investment.

Hypothesis 8: Organizational commitment has significant impact on the environmental investment.

Hypothesis 9: Organizational commitment has significant impact on the Proactive Environmental Strategies.

A direct impact on Environmental Investments by Organizational Commitment is not expected as in Customer Pressure. When there is Organizational Commitment, it is unlikely that Proactive

Environmental Strategy will not lead to Environmental Investments.

Hypothesis 10: Proactive environmental strategy mediates the relationship between customer pressure and environmental investment.

Hypothesis 11: Proactive environmental strategy mediates the relationship between organizational commitment and environmental investment.

2.4 Environmental investments as a mediator

The reference of contingency theory is made for explaining the role of environmental investments as a mediating variable in influencing the relation between environmental performance and proactive environmental strategy. There are three parts of performance in a systems model. These parts are input, output and process. A major role in formulating the association between performance and strategy is played by actions and processes. There is need to consider formulation as well as implementation in relation to each other rather than separately. It has been argued by [18] that there is difference between realized and intended strategies [30]. Moreover, in all cases, intended strategies may not be realized based on the implementation differences.

Limited research is available on the field of operations management that analyzes the association between performance, actions and strategy, though, the issue has been debated in a number of organizational studies. The use of strategy-actions-performance paradigm was made by [29]. The researchers analyzed the relational strategy to be predecessor of information and measurement systems. These later are predecessor of operations (internal and external). Internal and external operations influence the logistics performance, and these are similar to the environmental construct developed. has given another example related to the investments in infrastructure and structure of organizations. The structural investments refer to the improved technology and facilities. Improved workforce and organizational skills are involved in infrastructure. According to [22] same evidence is missing for management of environment. This research study aims at addressing the missing research by analyzing the relation between

environmental performance, environmentally proactive strategies and environmental investments.

The environmental and manufacturing performance is affected by making investments in environmental technologies. Real strategic development should be made by the firms for achieving higher environmental performance by proactive environmental strategies through environmental investments. According to [23] reality factor is referred as the use of resources in a way to management the environmental issues in an effective manner. The importance of environmental investments has been emphasized for achieving improved environmental performance through modifications of organizational processes and products. It has been stated by [25] that level of resource investment is one of the crucial indicators of the intensity in environmental technology. Many environmental areas are considered in proactive environmental strategies, the management of set areas or objectives would require environmental investments. Suppliers with inputs having a direct impact on the output of buying firms and processes are required to be considered as well.

Hypothesis 12: environmental investment mediates the relationship between customer pressure and environmental performance.

Hypothesis 13: environmental investment mediates the relationship between customer pressure, proactive environmental strategy and environmental performance.

Hypothesis 14: environmental investment mediates the relationship between proactive environmental strategy and environmental performance.

Hypothesis 15: environmental investment mediates the relationship between organizational commitment, proactive environmental strategy and environmental performance.

3. Methodology

The current study has employed the survey-based methodology. The questionnaire is adopted from the previous studies. The scale of environmental performance is adopted from the previous studies of

Zhu et al, [47] of environmental investment form of organizational commitment from [26] of proactive environmental strategy from Zhu et al. [46] and of Customer pressure from Zhu et al. [47].

For the purpose of data collection, the construction organizations were targeted, and 331 questionnaires were being delivered to these organizations, in Indonesia Afterwards, several reminders through phone calls and SMS were made in order to get desirable response rate. However, the respondents who have not sent their questionnaires back even after a month were being reminded through a telephone call or an email. Around 195 questionnaires were received back from the targeted respondents, out of which 17 of them were incomplete and found to be unusable, as an important part of them were found missing. A total of 179 questionnaires have undergone the process of further analysis. The response rate came out to be 53.7%, which is adequate for analysis. Since, a response rate of 30% is considered to be adequate [33].

4. Results

For testing the relation among constructs of the conceptual model, the Smart PLS Structural Equation Modeling is employed. Being a second-generation technique, it provides an alternate for the first-generation approach like multiple regression analysis. The distinctive feature among multiple regression and SEM is that, the former allows to incorporate only a single dependent variable while the latter is capable of simultaneously handling a set of dependent variables into the model [34]. The structural equation modeling has gained enough interest by the researchers in the area of behavioral sciences. The SEM enable researchers to add unobserved variables and then apply path analytic modeling. Latent variables are those variables which cannot be measured or observed directly in the study and are approximated through other indicators or measures. The present study includes all latent variables and require to be determined through their indicators. The structural equation modeling combines the structural and measurement models, also known as inner and outer models, respectively.

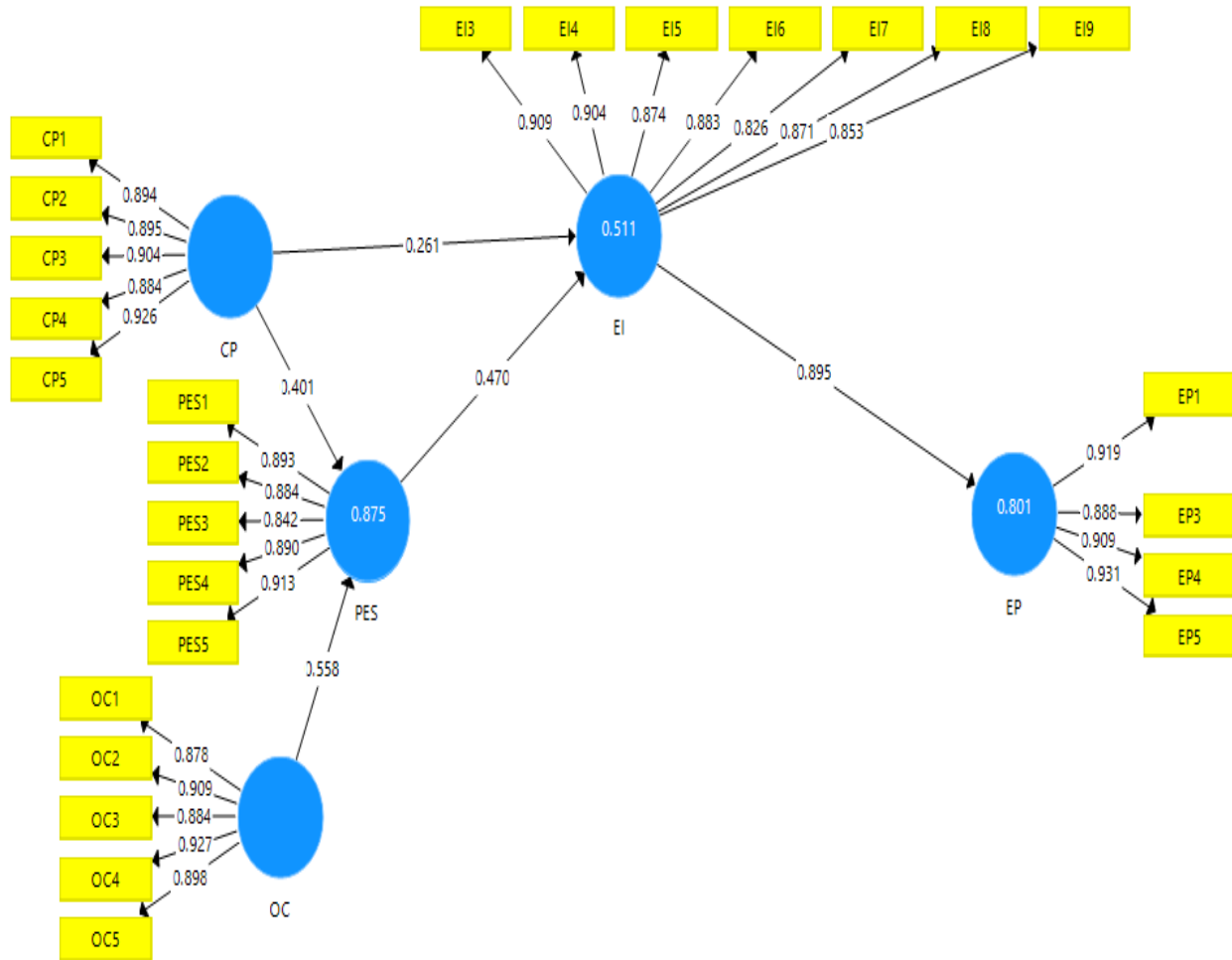


Figure 1. The Outer model

The loading values mapped in figure 1 are shown in the table 1. The values in the table highlight that the factor leading of all the item left is above 0.6 and the

item with loading less than 0.6 are deleted from final analysis.

Table 1. Factor Loading

	CP	EI	EP	OC	PES
CP1	0.894				
CP2	0.895				
CP3	0.904				
CP4	0.884				
CP5	0.926				
EI3		0.909			
EI4		0.904			
EI5		0.874			
EI6		0.883			

EI7		0.826			
EI8		0.871			
EI9		0.853			
EP1			0.919		
EP3			0.888		
EP4			0.909		
EP5			0.931		
OC1				0.878	
OC2				0.909	
OC3				0.884	
OC4				0.927	
OC5				0.898	
PES1					0.893
PES2					0.884
PES3					0.842
PES4					0.890
PES5					0.913

A recent study [28] has shown that goodness-of-fit index does not provide appropriate model validation. Furthermore, the structural model involves identifying the relation between independent and dependent latent variables, whereas, the measurement model allocates the indicators or items to each latent construct. Therefore, Duarte, P. A. O., & Raposo, M. L. B. [13]. suggested that the SEM allows to measure, describe, as well as predict the nature and extent of association between the latent constructs. During assessment of the measurement model, observing the reliability, and content validity of each item, internal consistency, convergent validity, and discriminant validity are essential. Hair et al. [16] also suggested to incorporate few indicators, as adding one or two items are considered to be sufficient. In order to appropriately estimate the latent variables, each latent must include two

measured items or indicators, as it may increase the degrees of freedom during complex model estimation.

Convergent validity is defined as the extent the intended latent constructs are represented by their items or indicators, and correlates to the other items of the same construct [37]. Based on the suggestion by Sharma et al. [36] the convergent validity is examined through determining the AVE of each construct involved in the research. However, the adequate level of convergent validity can be achieved if the value of AVE for each construct must be higher than 0.50. The values of AVE for this study are consistent with the recommended level and ranges from 0.567-0.8771, as shown in the Table All the loadings exhibit values greater than 0.50, which indicate the establishment of convergent validity for all the latent constructs of the model.

Table 2. Reliability

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
CP	0.942	0.943	0.955	0.811
EI	0.949	0.949	0.958	0.765
EP	0.932	0.934	0.952	0.832

OC	0.941	0.942	0.955	0.809
PES	0.931	0.932	0.947	0.783

The discriminant validity referred to the level a specific latent construct is different from the other constructs. Following the Duarte & Raposo, [14] the discriminant validity is established through AVE. They mentioned that the discriminant validity is

achieved when the square roots of AVE are compared with the correlations between the constructs. Moreover, the discriminant validity for this study is achieved through the criterion.

Table 3. Discriminant Validity

	CP	EI	EP	OC	PES
CP	0.901				
EI	0.685	0.875			
EP	0.681	0.895	0.912		
OC	0.899	0.654	0.691	0.900	
PES	0.903	0.706	0.726	0.919	0.885

After determining the measurement model, the next step is to estimate the structural model for present study. A bootstrapping procedure is applied, using a sample of 331 and bootstrap samples of 5000, for observing the importance of path coefficients. The structural model explains the dependence and reliance of the relation among constructs that are

involve in the hypothesized model [5]. Under PLS, the path-coefficients and t-values of the structural model are observed before assessing the relation among the latent constructs. With regard to path coefficient, PLS is viewed as a standardized beta-coefficient. The path model for the current framework is shown the figure 2.

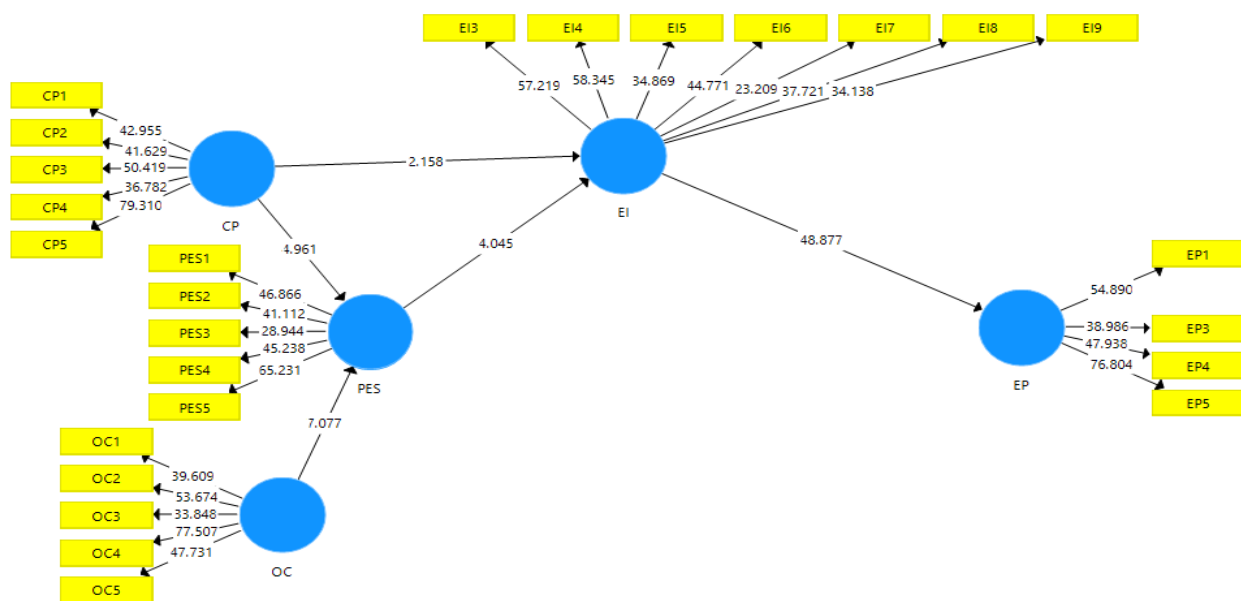


Figure 2. Outer model

Primarily, a model is estimated followed by the assessment of the correlation and regression variables that are hypothesized in the model. According to the hypothesis development view, the parsimonious

models are also supported by the PLS-SEM, since it requires minimum number of parameters for model estimation.

Table 4. Direct relation

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
CP -> EI	0.450	0.449	0.092	4.869	0.000
CP -> EP	0.403	0.401	0.083	4.858	0.000
CP -> PES	0.401	0.396	0.081	4.961	0.000
EI -> EP	0.895	0.895	0.018	48.877	0.000
OC -> EI	0.262	0.265	0.071	3.689	0.000
OC -> EP	0.235	0.237	0.064	3.656	0.000
OC -> PES	0.558	0.563	0.079	7.077	0.000
PES -> EI	0.470	0.472	0.116	4.045	0.000
PES -> EP	0.421	0.423	0.106	3.962	0.000

The indirect relationship mapped in the figure 2 are described in the table 5 below

Table 5. Indirect relation

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
CP -> PES -> EI	0.189	0.188	0.065	2.909	0.004
OC -> PES -> EI	0.262	0.265	0.071	3.689	0.000
CP -> EI -> EP	0.234	0.233	0.108	2.170	0.030
CP -> PES -> EI -> EP	0.169	0.168	0.059	2.848	0.004
PES -> EI -> EP	0.421	0.423	0.106	3.962	0.000
OC -> PES -> EI -> EP	0.235	0.237	0.064	3.656	0.000

[40] have argued that another powerful criterion to examine PLS-SEM model is the R-square (R^2) or the coefficient of determination. R^2 value explains that the proportion of variation in dependent variable is equally explained by the predictor variables [16]. A minimum acceptable value for R^2 is 0.10 as

recommended by [45]. Meanwhile, [46] also suggested that under PLS-SEM the R^2 values such as, 0.67, 0.33, & 0.19, are referred as substantial, moderate, or weak, respectively. The R^2 values for the latent variables are shown in the Table 6.

Table 6. R Square

	R Square
EI	0.511
EP	0.801
PES	0.875

5. Conclusion

The main objective of the current research is examine role played by environmental investments in the association between environmentally proactive strategies and environmental performance in supply chain, and also to examine the reason behind the adoption and implementation of environmentally proactive strategies is affected by organizational commitment and customer pressure in the supply chain. The literature regarding environmental performance and environmental strategies has been sourced in this research study. After the review of literature, hypotheses have been formulated for testing. The moderator (organizational commitment) is analyzed along with the external factor (customer pressure) in the model devised for evaluation. After the formulation of conceptual model, research methods are presented, and data is analyzed through online questionnaire survey. PLS method has been used for analysis. The research does not focus on analyzing the variables enabling the occurrence of environmental practices rather it is based on practices, which are environmentally sound. It has been suggested by the previous research studies that the main factors are organizational commitment and customer pressure. The study has used questionnaire adapted from the prior studies to collect the data. The SEM-PLS is used to analyses the collected data. Due to limited research available on the association of corporate environmental practices and supply chains specific to the emerging countries, the data has been collected in the manufacturing industry of Indonesia. The findings of the study have been discussed along with limitations. The research also gives implications for future. In the current study The two arguments have been combined incorporating the direct and indirect impact of customer pressure on environmental investments. There exists strong evidence in literature about the environmental

investments are resulted by customer pressure. The way in which environmental investments (direct and indirect) are influenced by customer pressure is not clear in literature. When a firm implements a proactive environmental strategy, this means customer pressure has an indirect affect, which resulted in environmental investments. Customer pressure acts as an external force, which leads to the implementation of an environmentally proactive strategy. Higher investments can be caused by customer pressure. This is the direct affect created by customer pressure. As a reactive approach, firms make higher investments. Environmental investments are made because of necessity by the firms rather than conviction.

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