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Mediating role of Environmental Education for Sustainable Supply chain Performance: Empirical Evidence from Chemical Companies of Pakistan

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Abstract

Previous studies have been conducted in developed countries, and only a few are conducted in developing countries. Furthermore, a contribution of this is that the mediating role of environmental education is considered in the present study. This study aimed to identify the mediating role of environmental education between internal environmental management, supplier selection, and green packaging on sustainable supply chain performance in Pakistan. A total of 250 chemical companies filled out the questionnaire. The findings of this study revealed a partial mediation effect of environmental education for internal environmental management, supplier selection, and green packaging in sustainable supply chain performance in Pakistan. However, the supplier selection results are more critical compared to internal environment management and green packaging due to the higher beta value. This study proposed a pivotal variable to achieve a sustainable supply chain in developing countries such as Pakistan.

Keywords:
environmental; education; sustainable; supply chain; performance

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INTRODUCTION

There are various challenges including health, environmental and socio-economic are faced by society due to industrial toxic, ineffective waste management and air pollution from industrial sector in developing countries is noticed (Elfithri & Mokhtar, 2018). These issues also lead to serious concerns about the health and safety risks to workers. All-environmental related problems can be addressed to some extent through green practices in both developed and developing countries (Kannan et al., 2019). In the current competitive environment, the majority of manufacturing companies are adopting green supply chain practices due to pressure from the local community in which areas they are operating (Sezen & Çankaya, 2018). Green packaging cannot be ignored related to value chain components, which has direct effect on sustainable supply chain performance (Sarkis, 2003). Number of green packaging practises inculding eliminating excessive packaging,, simple packaging and easy disassembly are related to green supply chain (Kung et al., 2012). Internal environmental management can be said to be the firm's own internal policies and their implementation to achieve sustainable environment (Chan et al., 2012). The success is only possible when all levels of the employee are involved at the same level with the same objective from the top level to the lower level (Zhu et al., 2005). Past empirical studies revealed their academic research on environmental education for sustainable supply chain performance (Sarkis et al., 2010; Sammalisto & Brorson, 2008). Environmental education is having important role in changing the attitude of employees towards the environment (Sammalisto & Brorson, 2008). Supplier selection is also play a key role for sustainable supply chain performance because it determines the right selection of suppliers that carry their environmentally friendly processes in their operations (Min & Galle, 2001; Paulraj, 2011; Tseng & Chiu, 2013).

The sustiability paid attention by researchers and they started to produce publications on this issue after 1987. In these publications they clarily stated that the safety should be maintined for the surivial of future generations with better standard of living. There are three key diminsions of sustainbliity are studied in the past studies such as economics, environmental and social performance. However, due to complexity of business operations such as supply chain operations from raw material to deliveriy of goods and services to end-customers is not easy to achieve in today's competitive market. Therefore, keeping in view, the past studies in the filed of academica published many papers on green supply chain in order to obtaining the sustainable development in their respective areas (Sarkis et al., 2011; Green et al., 2012). The green supply chain is an important issue which must be addressed in multidisciplinary areas (Eltayeb et al., 2011). There are many environmental problems that are casuing the global warning, including environmental pollution, negative impact on biological diversity, reduction of natural resouces so on. Fact of matter is that these problems are end product of companies operations including supply chain operations, which develop a great pressure from both community and government as well (Walker et al., 2008). Therefore, the green supply chain management is one of the solution in order to address these problems (Adriana, 2009).

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In the past many studies have been conducted in regard to green supply chain management practices in economic and environmental dimensions. Here, a few studies are mentioned which examined the impact of green supply chain management practises on economic performance (Younis et al., 2016; Schmidt et al., 2017, Zhu et al., 2013). Similary, on environmental performance (Chien & Shih, 2007). However, the important area sustainanble supply chain performance is not studied in above mentioned studies. In this regard, there are theortical and methodological contributions of present study. First methological contributions in this study is, it is suggested by Geng et al. (2017) & Chao (2020) developing countries should be studied in the context of sustainable supply chain. Therefore, the major cities of Pakistan have been targeted including Karachi, Lahore and Quetta for better representative of sample size from Pakistan as a developing country. Second methological contributions in this study is, similar study conducted in India with only 107 sample sizes (Ghosh et al., 2021). However, the present study increased the sample size from 107 to 250 in order to verify the previous study's findings. One theortical contribution of present study is that the mediation effect of environmental education is checked. Based on limited knowledge of the authors, this is a first study that checked the mediating effect of environmental education in the context of sustainable supply chain performance in the chemical companies of Pakistan. Therefore, the objective of the study to examine the mediating role of enviormental education for sustainable supply chain performance in chemical companies of Pakistan.

METHODS

This study is based on primary data which is collected through a adopted questionnaire from past studies and a survey method is applied. The respondents were requested to fill google form online questionnaire and link of questionnaire were shared via various social media platforms including WhatsApp, e-mail and facebook with concern HR department due to their privacy concern policy. The environmental management is an important due to global warming situation among world. Furthermore, it is suggested by Zhu et al. (2013) & Esfahbodi et al. (2017) that the manufacturing companies in developing countries in context of sustainable supply chain performance must studied. Therefore, in the present study, chemical companies which are related manufacturing sector are considered as the population of present study. Employees from both the middle level and the upper level requested to fill the questionnaire voluntary. The name of employee were not disclosed. Data gathered from March 2022 to May 2022 (three months). Total 300 questionnaire were distributed among employee who are working the chemical companies of Paksitan. However, only 250 questionaire were considered after data cleaning process by the authors. Therefore, the response rate for this study is 83 percent. Most of the time is suggested by Pagell et al. (2004), the response rate in supply chain management is acceptable upto 20 percent.

In this study AMOS (analysis of moment structures) is used to conduct two important tests such as confirmatry factor analysis and covariance-based structural equation modelling (CB-SEM). The proposed hypothesis are tested with help of bootstrap procedure

which is recommended for data is analysed (Enders, 2005). Furthermore, structural equation modelling is also suggested for mediation effect as well (Cheung & Lau, 2008). First of all in this study, the measurement model is tested to find the convergent validity and reliability of collected data. Second, CB-SEM analysis were performed for testing the proposed hypthteis (Hair et al., 2012).

The green packaging items were adopted from past of Shang et al. (2010). Research items including "Reduction of packaging materials, Ecological materials for primary packaging, Recyclable or reusable packaging/containers in logistics, Packaging made from materials healthy in all probable end-of-life scenarios". The internal environmental management scale developed by Zhu et al. (2007). Research questions are "Commitment of GSCM from senior managers, Cross-functional cooperation for environmental improvements", Support for GSCM from mid-level managers", "Cross-functional cooperation for environmental improvements". The supplier selection is taken from the study of Paulraj (2011). Sample research items are "We select suppliers based on their environmental competence", Suppliers are selected based on their ability to support our environmental objectives", We select suppliers based on their technical and eco-design capability", "We select suppliers based on their environmental performance".

The environmental education is adopted from the study Wang & Chiou (2010). Research items are "Periodic updating of the website on environmental issues, Natural environmental seminars for executives, sponsoring of environmental events/collaboration with ecological organizations, Holding awareness seminars for suppliers/contractors". Lastly, the sustainable supply chain performance is adopted from the study Chowdhury (2014). Research questions are "We take adequate measures to control air pollution, we control the use of hazardous materials and chemicals (lead, Azo or other banned chemicals etc.) in products, we have environmental certification and audit, we evaluate the environmental performance of suppliers".

RESULTS AND DISCUSSION

Table 1 shows the demographics of the respondents which are divided into frequency and percentage. The total number of respondents are 250 where gender of respondents in which, male is 151 or 60.4% and female are 99 or 39.6%. Age of respondents in which, 18-24y are 33 or 13.2, 25-29y are 68 or 27.2%, 30-34 are 24 or 9% and 35 or above are 125 or 50.8%. Education of respondents in which, Intermediate holders are 18 or 7.2%, Bachelor's holders are 150 or 60% and Master holder are 82 or 32.8%.

It is suggested by Hair et al., (2014) that the before testing the hypothesis the instrument's (questionnaire) validity and reliability must be checked. Similarly, Anderson & Gerbing (1988) also highly recommended to check the validity and reliability before testing the proposed hypothesis. You can notice the measurement of model of this study is shown in the Table 2. All research items and extracted average variance values fall more than the recommended value of 0.50 (Hair et al., 2014). The highest research item is 0.933 and highest AVE is 0.78. Furthermore, the lowest research item is 0.518

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and lowest AVE is 0.50. Lastly, the composite reliability is also ranges from 0.71 to 0.93. The suggested value is that it should be more than 0.70. Therefore, for this study validity and reliability is obtained and second phase (hypothesis testing) can be conducted in order to conclude the findings of present study.

Table 1. Demographics of Respondents

		Frequency	Percentage
Gender	Male	151	60.4
	Female	99	39.6
Age	18-24	33	13.2
	25-29	68	27.2
	30-34	24	9.6
	35 or above	125	50.0
Education	Intermediate	18	7.2
	Bachelors	150	60.0
	Masters	82	32.8

Source: Author's Calculations

Table 2. Convergent Validity and Reliability

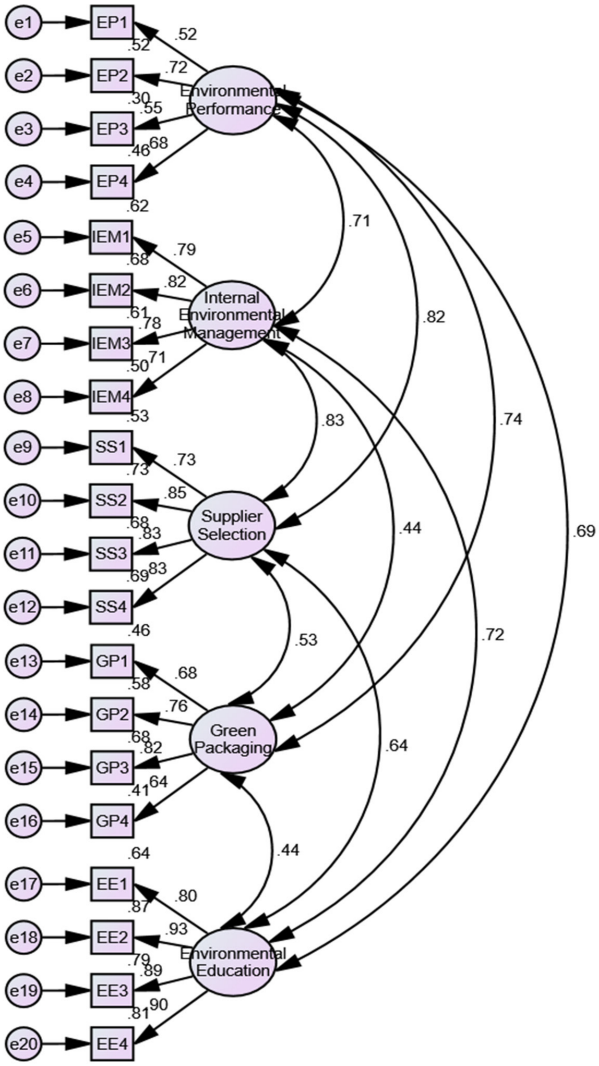
Factor	Item	Standardize Items	Composite Reliability	AVE
Internal Environment Management	IEM1	.787	.86	.60
	IEM2	.823		
	IEM3	.779		
	IEM4	.709		
Supplier Selection	SS1	.726	.88	.65
	SS2	.851		
	SS3	.826		
	SS4	.828		
Green Packaging	GP1	.676	.82	.53
	GP2	.760		
	GP3	.825		
	GP4	.638		
Environmental Education	EE1	.801	.93	.78
	EE2	.933		
	EE3	.890		
	EE4	.901		
Sustainable supply Chain Performance	SSCP1	.518	.71	.50
	SSCP2	.724		
	SSCP3	.547		
	SSCP4	.679		

Source: Author's Calculations

Table 3 shows that there are three effects including total effect, direct effect and indirect effect. The value of beta and significant value are .181, .101, .080 and .027, .000 and .001 respectively. Therefore, the partial mediation effect of environmental education in

the present study is revealed between internal environmental management and sustainable supply chain performance. Furthermore, the beta value is also reduced from .101 to .080 in the presence of mediator environmental education and was also found to have a significant impact (p-value =.001). Therefore, the partial mediation effect confirmed and the three proposed hypotheses H1a, H1b, and H1c are supported.

Figure 1. Confirmatory Factor Analysis (CFA)



There are three effects that can be seen in the Table 4 including total effect, direct effect and indirect effect. The beta value and significant value are .379, .335, .044 and .000, .000 and .001 respectively. Therefore, the partial mediation effect of environmental education in the present study is revealed between supplier selection and sustainable supply chain performance. Furthermore, the value of beta is also reduced from .335 to .044 in presence of mediator environmental education and found to have significant impact (p-value=.001) as well. Therefore, the partial mediation effect was confirmed and the three proposed hypotheses H2a, H2b, and H2c are supported.

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Table 3. Convergent Validity and Reliability

Hypothesis	Directions of Paths (SEM)	Path beta value	P-value	Remarks
H1a	IEM->SSCP	.181	.027	Supported
H1b	IEM->SSCP	.101	.000	Supported
H1c	IEM->EE->SSCP	.080	.001	Supported

There are three effects that can be seen in the Table 4 including total effect, direct effect and indirect effect. The beta value and significant value are .288, .271, .016 and .000, .000 and .047 respectively. Therefore, the partial mediation effect of environmental education in the present study is confirmed between green packaging and sustainable supply chain performance. Furthermore, the value of beta is also reduced from .271 to .016 in presence of mediator environmental education and found to have significant impact (p-value=.001) as well. Therefore, the partial mediation effect was confirmed and all three proposed hypotheses H3a, H3b, and H3c are supported.

Table 4. Supplier Selection (Mediation effect)

Hypothesis	Directions of Paths (SEM)	Path beta value	P-value	Remarks
H2a	SS->SSCP	.379	.000	Supported
H2b	SS->SSCP	.335	.000	Supported
H2c	SS->EE->SSCP	.044	.001	Supported

Table 5. Green Packaging (Mediation effect)

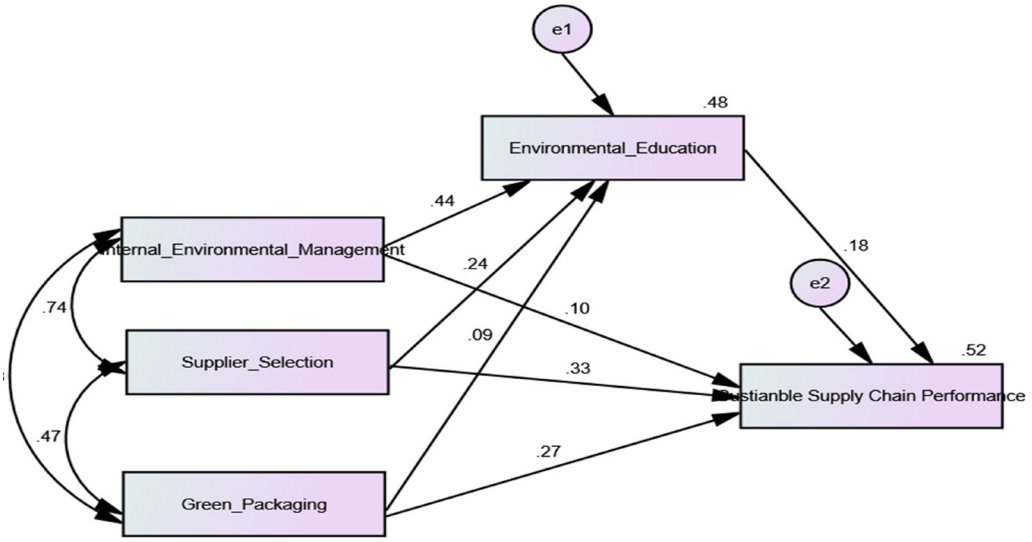
Hypothesis	Directions of Paths (SEM)	Path beta value	P-value	Remarks
H3a	GP->SSCP	.288	.000	Supported
H3b	GP->SSCP	.271	.000	Supported
H3c	GP->EE->SSCP	.016	.047	Supported

In this present the partical mediation effect of environmental education is confirmed for both internal enviormental management and green packing on sustianble supply chain performance with indirect effects of beta values 0.80 and 0.16 with p-values 0.001 and 0.047 respectively. The findings of this study are alighed with past studies. A recent study conducted by Sezen & Cankaya (2018), also confimrd positive and significant impact of internal environment management and green packaging for sustainable supply chain performance. Similarity, study carried out in China by Khan & Yu (2019), also revealed positive and significant significant impact of internal environment management and green packaging for sustianble supply chain performance. Lastly, results showed that there is positive and significant impact of internal environment management and green

packaging on sustainability performance in Jordan (Park et al., 2022; Al-Ghwayeen & Abdallah, 2018).

Furthermore, partical mediation effect of environmental education is confirmed for supply selection on sustianble supply chain performance with indirect effects of beta values 0.44 with p-values 0.001. A recent study conducted in India by Ghosh et al. (2021; 2022) also confirmed the role enviromental education for supply selection and sustianblilty supply chain performance. Another study conducted in Turkey on the manufacturing sector found that supplier selection and sustianble pefromance positvly related to each other (Asiaei et al., 2022; Yildiz et al., 2019). Laslty, the study carried in China by Quan et al., (2018) also confirmed the same findings.

Figure 2. Structural Equation Modelling



CONCLUSION

The purpose of this study to examine the mediating role of envirmental education for indpedent variables including internal environmental education, supplier selection and green packaing on sustainable supply chain performance in chemical companie of Pakistan. Findings revealed that the partial mediation effect of environmental education of all independent variables including internal environmental management, supplier selection, and green packaging on sustainable supply chain performance. However, supplier selection is found to be more significant compared to other independent variables such as internal environmental management and green packaging. Therefore, based on these findings it can be concluded that the enviormntal education is an important for achieving sustianble supply chain performance within chemical companies of Pakistan.

Present study will help the both main stakeholders such as academia and chemical companies which are operating in developing country like Pakistan that the enviormental situation can be improved through adopting identified enviormental education variable's role in designing the business strategies for acheiveing sustianble supply chain performance.

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In addition, variables such as internal environment management, supplier selection, and green packaging will bring a positive outcome in terms of positive environmental impact in developing countries like Pakistan.

Many contributions are in the present study that cannot be ignored. However, there are always limitations and future research directions for future researchers. First, the present study did not cover the maximum number of manufacturing companies. Hence, the result can not be generalized for whole manufacturing sector. Second, due to time and resource constraints, the sample size was limited to 250 only. Third, a serial mediation effect can be checked in the future by designing the complex model by adding more variables such as age and experience of the employee, etc.

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