

Green supply chain management practices: direct effects sustainability performance of vocational colleges in Thailand

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Abstract

The aim of this study is to examine the role of green supply chain management (GSCM) practices in sustainable performance of vocational colleges, Thailand. Three GSCM practices are considered; green purchasing, green packaging and green marketing. The relationship between green purchasing, green packaging, green marketing, environmental protection and sustainable performance is considered. As the population of the study is the vocational colleges of Thailand, therefore, data collection is made from these colleges. The questionnaires were distributed among the employees of these colleges. 235 responses are used for data analysis. Findings shows that; GSCM practices has pivotal role to enhance sustainable performance. Implementation of GSCM practices such as green purchasing, green packaging and green marketing has positive influence to promote sustainable performance of vocational colleges in Thailand. Green purchasing, green packaging and green marketing has positive effect on environmental protection which further causes to increase sustainable performance.

Keywords. Green supply chain management, sustainable performance, environmental performance, green purchasing, green packaging, green marketing, vocational colleges Thailand.

1. Introduction

Long-term performance sustainability in any industry is most difficult for the companies (Lizińska & Czapiewski, 2018; Thierfelder & Mhlanga, 2022). The achievement of long-term sustainable performance has several benefits however it takes more than longer time to sustain the performance. It is a bigger challenge for companies to achieve higher performance and sustain this performance. Performance can be sustained for shorter period of time but it is most difficult for companies to sustain this performance for longer period of time. There are several challenges faced by companies to sustain performance (Maziriri, 2020; Minhas et al., 2015). Generally, in a competitive environment the competitors have major influence on the performance of companies. Due to the stiff competition in the market, it is most difficult for companies to achieve higher performance. Because there are several limitations in the market which cannot allowed the business activity to achieve a sustainable level in performance (Brookes, 2020).

Similarly sustainable performance is one of the major challenges in education industry (Abbas et al., 2019; Afum et al., 2020). Along with the competition in business industry, the education industry is also facing the competition in current decade. Due to the increase in educational institutions and with the increase in technology among these institutions, the competition is increasing significantly. In this competition each institution wants to capture a greater number of students and to provide quality education. Most importantly the vocational institutions are facing such issues in performance. But in this competition, the achievement of performance is based on several elements such as innovation and technology. Both these elements are lacking in vocational institutions as these situations are lacking to provide innovative methods in knowledge transformation along with the skill development activities. The vocational institutions in Thailand are providing skill-based education to the students (Sa-Nguanmanasak & Khampirat, 2019; Xie et al., 2019) to construct their skill-based education which require innovative activities along with the latest technology which is lacking among these

environment. In this way the use of soft copy for teaching can play most important role rather than the use of hard copy. Therefore, the concept of green purchasing is most important and to protect the environment (Al-Swidi & Saleh, 2021; Augustsson & Granberg, 2022; Chen & Lin, 2019). The educational institutions should use green purchasing which can be more efficient in the way of cost as well as environment. Number of studies highlighted green purchasing in various business industries, but it is also important in educational institutions such as vocational training colleges which is not addressed by previous studies. This study focused that green processing has significant positive role to promote environmental protection which further led to the sustainable performance. As given in previous studies the environment protection has relationship with the performance. The activities carried out by the institutions to protect the environment led to the more cost efficient and reflect a positive effect on the public which causes to increase the sustainable performance. This study proposed that environmental protection could be used as mediating variable between green purchasing and sustainable performance. As green purchasing causes to increase environmental protection which further enhance sustainable performance among vocational colleges (Danielle, 2020; Domingo Pavolo, 2020; França & Quevedo, 2020; Meyer & Hassan, 2020).

Hypothesis 1. Green purchasing has positive effect on sustainable performance.

Hypothesis 2. Green purchasing has positive effect on environmental protection.

Hypothesis 3. Environmental protection has positive effect on sustainable performance.

Hypothesis 4. Environmental protection mediates the relationship between green purchasing and sustainable performance.

Green packaging, also called sustainable packaging (Hu et al., 2018; Jafarzadeh et al., 2020) uses materials as well as manufacturing methods to reduce energy use and decrease the harmful influences of packaging on the environment. Green packing solutions often comprise biodegradable as well as recyclable materials in preference to materials like plastic and Styrofoam. This explanation is based on various business industries such as manufacturing industries; however, the current

study is dealing with educational institutions and education institutions are not manufacturing any product. Therefore, this study is not dealing with the packaging of manufacturing products but it is dealing with the packaging related to the various educational institutions. The packaging at educational institutions is based on the packaging of various examination paper bundles. It is also based on the packaging of various products used to deliver educational services. This packaging used among the educational institutions is most important in the environment because it may have influence on the environment. The use of packaging at these educational institutions may lead to the negative effect on the environment. However, it is the ethical responsibility of educational institutions to protect the environment with the help of efficient packaging. Packaging has major role on the environment as reported in previous studies (Khan et al., 2019; Xie et al., 2019) that packaging may effect negatively on the environment. Therefore, it is needed to make various strategies to promote efficient packaging for the protection of environment. In this way, the concept of green packaging is most influential in environmental protection. The green packaging strategies adopted by vocational college institutions on the environment and it can lead to the environmental protection. Therefore, green packaging has positive effect to promote environmental protection. The packaging used to deliver different products for the educational services can be well managed with the concept of green packaging. Therefore, green packaging has direct effect on environmental protection (Xie et al., 2019). Furthermore, it also has effect on sustainable business. As given in previous studies that green packaging has significant relationship with business sustainability (Maziriri, 2020; Minhas et al., 2015). As in the environment where number of businesses are working and harming to the environment, the activities related to the green packaging can help to protect environment which causes to enhance the positive effect on sustainable performance. In this way, the current study proposed green packaging which has positive influence on environmental protection and further increases the sustainable performance. Therefore, environmental protection is playing a mediating role between green packaging and sustainable performance (Alnusairat et al., 2021; Areias &

Eiriz, 2020; Chaya et al., 2021; Emina, 2020; Linqi et al., 2020; Österberg & Nilsson, 2020).

Hypothesis 5. Green packaging has positive effect on sustainable performance.

Hypothesis 6. Green packaging has positive effect on environmental protection.

Hypothesis 7. Environmental protection mediates the relationship between green packaging and sustainable performance.

Marketing activities are always helpful to promote various products and services (Chen & Lin, 2019; Ismail et al., 2018). Along with other businesses education institutions such as vocational training institutions are also using marketing activities to promote their services. These services also have effect on the environment. The paper used for marketing purposes can increase the pollution in the environment. On the other hand, various studies provided the concept of green marketing which is more beneficial as compared to the conventional marketing. The green marketing activities are based on electronic marketing which has wider coverage, low-cost and less time consuming as compared to the conventional marketing activities. Therefore, the adoption of green marketing activities by the vocational colleges can promote environmental protection. The promotion of environmental protection with the help of green marketing may have positive role to enhance sustainable performance. Therefore, it is playing a significant role to promote sustainable performance directly as well as indirectly for environmental protection. Thus, it is observed that environmental protection is playing a mediating role between green marketing and sustainable performance. Hence, the current study uses environmental protection as mediating variable between green marketing and sustainable performance.

Hypothesis 8. Green marketing has positive effect on sustainable performance.

Hypothesis 9. Green marketing has positive effect on environmental protection.

Hypothesis 10. Environmental protection mediates the relationship between green marketing and sustainable performance.

3. Research Methodology

This study considered the vocational colleges to examine the sustainable performance. This study considered education industry because of several reasons. Most importantly the previous studies have not considered sustainable performance. Particularly, the sustainable performance among the vocational institutions is not addressed. Several previous studies highlighted sustainable performance in relation to the business industry, however, education industry is not considered. Therefore, this study considers sustainable performance with the help of quantitative research approach in which a cross-sectional research design is used. A questionnaire survey is used to measure dependent variable namely; sustainable performance. The other variables such as green purchasing, green packaging, green marketing and environmental protection are also measured by using a questionnaire. Therefore, questionnaire is designed for the study by using a ready revealed scale items in previous studies. This study considered three elements of GSCM which include; green purchasing, green packaging and green marketing. Green purchasing measured with the help of considering various purchase activities of the vocational colleges to perform various operations. In this way this study considered the purchasing of material for the use of educational activities. Furthermore, green packaging is also considered in this study in relation to the various services provided to the students. In addition, green marketing is considered by considering the activities of these institutions and its effect on environment due to the marketing activities. Environmental protection is measured by using the policy made by these institutions to protect the environment with the help of various initiatives. Furthermore, sustainable performance is measured by using the performance of these institutions by considering the results of the students and their performance in skill-based activities.

This study used simple random sampling to collect data from the respondents. As the respondents of the current study are the employees working in vocational institutions. Therefore, 500 questionnaires were distributed among these employees. Only the employees working in supply chain activities were considered in this study. Finally, 235

questionnaires were received in questionnaire survey. The collected data was examined to check the missing value as well as other errors in the data. It is found that there is total 15 missing values in different variables. All these missing values treated with the help of recommended methods in the literature. It is found that sustainable performance has five

outliers, packaging has three outliers, environmental protection has two outliers and marketing has four outliers. It is important to manage all these outliers because it can affect on the results. All these outliers are removed from the study and finally the data statistics are given in Table 1.

Table 1. Data Statistics

	No.	Missing	Mean	Median	Min	Max	SD	Kurtosis	Skewness
GPU1	1	0	3.196	3	1	7	1.462	-0.336	0.101
GPU2	2	0	3.368	3	1	7	1.822	-0.577	0.462
GPU3	3	0	3.422	3	1	7	1.627	-0.211	0.331
GPU4	4	0	3.373	3	1	7	1.734	-0.567	0.265
GPAC1	5	0	3.328	3	1	7	1.736	-0.825	0.13
GPAC2	6	0	3.583	3	1	7	1.831	-0.665	0.279
GPAC3	7	0	3.436	3	1	7	1.769	-0.356	0.513
GPAC4	8	0	3.426	3	1	7	1.881	-0.84	0.267
GMAR1	9	0	3.373	3	1	7	1.765	-0.438	0.412
GMAR2	10	0	3.544	3	1	7	1.75	-0.457	0.354
GMAR3	11	0	3.005	3	1	7	1.419	0.114	0.644
GMAR4	12	0	3.044	3	1	7	1.362	0.953	0.904
GMAR5	13	0	3.123	3	1	7	1.276	1.323	0.91
EP1	14	0	3.049	3	1	7	1.339	0.734	0.738
EP2	15	0	3	3	1	7	1.287	0.451	0.542
EP3	16	0	3.074	3	1	7	1.35	0.387	0.564
EP4	17	0	3	3	1	7	1.28	0.595	0.651
EP5	18	0	2.966	3	1	7	1.391	-0.09	0.458
SP1	19	0	3.103	3	1	7	1.308	0.502	0.603
SP2	20	0	3.059	3	1	7	1.396	0.224	0.636
SP3	21	0	3.044	3	1	7	1.341	0.436	0.669
SP4	22	0	3.113	3	1	7	1.314	0.067	0.482
SP5	23	0	3.064	3	1	7	1.303	0.271	0.511
SP6	24	0	2.956	3	1	6	1.261	-0.245	0.467

4. Data Analysis

In data analysis, the current study examined the effect of green purchasing on sustainable performance. The effect of green packaging is also considered in relation to the sustainable performance. Furthermore, this study also observed the effect of green marketing on sustainable performance. In addition to this, the current study also checked the direct effect of green purchasing on environmental protection. The direct effect of green packaging and green marketing is also considered on environmental protection. Finally, indirect effect in this study considered the direct effect of environmental protection on sustainable performance. Additionally, the current study checked the three-mediation effects. First mediation effect of environmental protection is examined between green purchasing and sustainable performance. The second mediation effect is considered between green packaging and sustainable performance. Third mediation effect is considered between green marketing and sustainable performance.

However, before to check the aforementioned relationship, the current study checked the reliability and validity. For this purpose, this study employed partial least square (PLS) (Hair et al., 2017; Khan et al., 2019) PLS is based on the structural equation modeling (SEM) which is most prominent data analysis software and data analysis technique to examine the relationship by using primary data. In first part of this data analysis technique the factor loading is considered which is given in Table 2. Additionally, the first part of data analysis is given in Figure 2. This study considered 0.5 as minimum level of factor loading to retain scale items. It is highlighted in Figure 2 that green purchasing is measured by using four scale items, green packaging is measured by using four items. Green marketing is measured by using five items. The environmental protection is measured by using five items and finally sustainable performance is measured by using six items. It is observed that all the scale items for these variables have factor loading above 0.7. The factor loading above 0.7 is the satisfactory level to retain the items. Thus, all the scale items are retained.

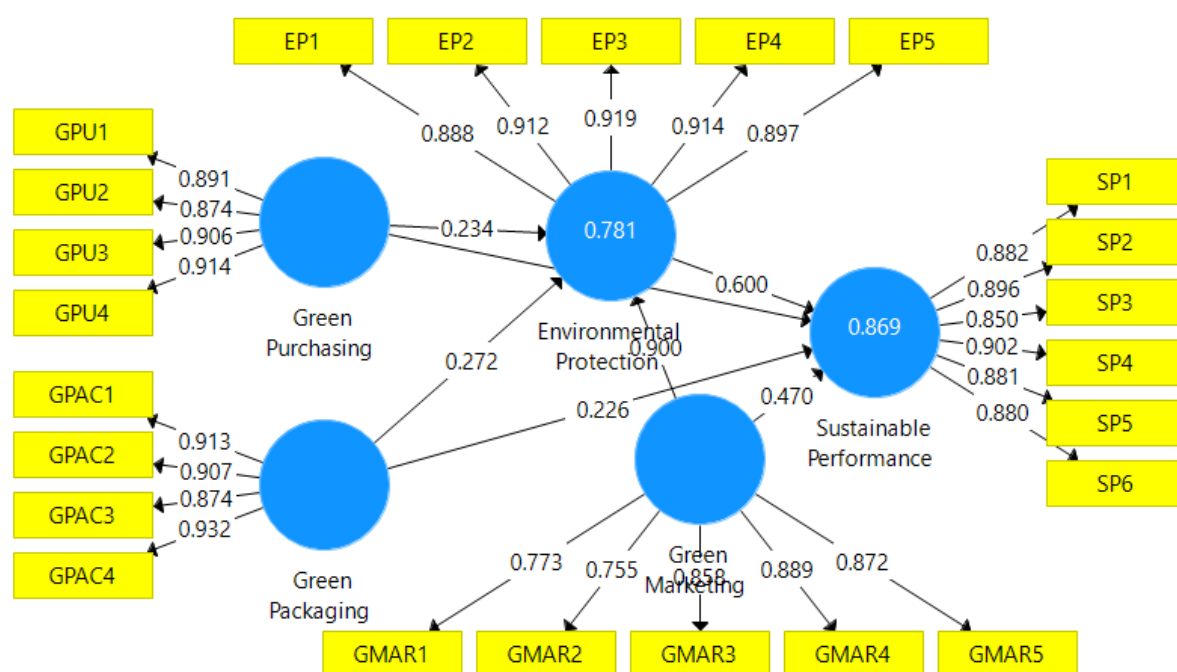


Figure 2. Measurement Model Assessment

Table 1. Factor Loadings

Variables	Items	Loadings	Alpha	CR	AVE
Environmental Protection	EP1	0.888	0.945	0.958	0.821
	EP2	0.912			
	EP3	0.919			
	EP4	0.914			
	EP5	0.897			
Green Marketing	GMAR1	0.773	0.889	0.917	0.691
	GMAR2	0.755			
	GMAR3	0.858			
	GMAR4	0.889			
	GMAR5	0.872			
Green Packaging	GPAC1	0.913	0.927	0.949	0.822
	GPAC2	0.907			
	GPAC3	0.874			
	GPAC4	0.932			
Green Purchasing	GPU1	0.891	0.918	0.942	0.803
	GPU2	0.874			
	GPU3	0.906			
	GPU4	0.914			
Sustainable Performance	SP1	0.882	0.943	0.955	0.778
	SP2	0.896			
	SP3	0.85			
	SP4	0.902			
	SP5	0.881			
	SP6	0.88			

The confirmation of scale items shows the internal items reliability confirmation. Further needed to examine the composite reliability, convergent validity and discriminant validity. To consider the convergent validity, the current study considered composite reliability and average variance extracted (AVE). It is given in Table 2 that all the constructs have achieved

convergent validity because composite liability is above 0.7 and AVE is above 0.5. Finally in this part of data analysis, Table 3 shows the AVE square root which is used to check the discriminant validity. In addition to this the current study also used the method of cross loadings to check the discriminant validity.

Table 3. AVE Square Root

	Environmental Protection	Green Marketing	Green Packaging	Green Purchasing	Sustainable Performance
Environmental Protection	0.906				
Green Marketing	0.779	0.831			
Green Packaging	0.638	0.766	0.907		
Green Purchasing	0.697	0.797	0.637	0.896	
Sustainable Performance	0.713	0.774	0.575	0.644	0.882

The results on the relationship between green purchasing, green packaging, green marketing, environmental protection and sustainable performance is given in Table 4. Table 5 also shows the indirect effect results. It is given in Table 4 that all the relationships have t-value above 1.96 (Hair et al., 2019). All the relationships also have beta value positive. Therefore, it is found that environmental protection has positive effect on sustainable performance. Green marketing also has positive effect on environmental protection. Green

marketing also has positive effect on sustainable performance. Green packaging shows also similar relationship with environmental protection and sustainable performance. It shows that it has positive effect. It is also addressed by the results of the study to promote environmental protection could be helpful to enhance sustainable performance. It is also addressed by the results of the study that green purchasing has significant positive effect on environmental protection and sustainable performance.

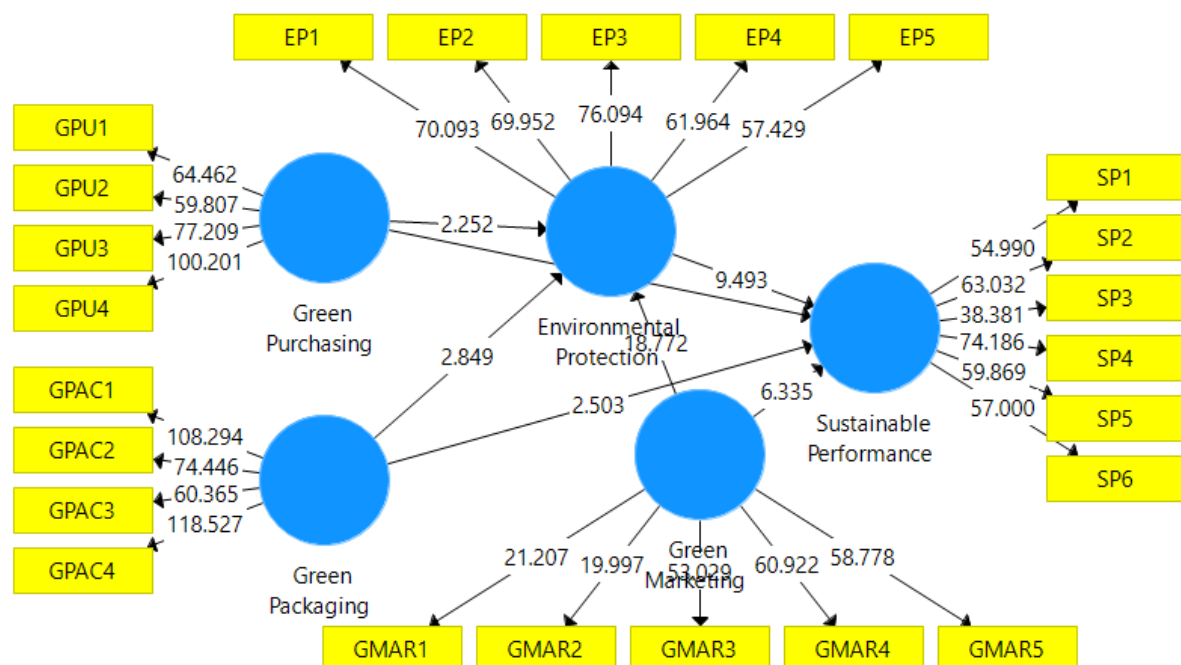
**Figure 2.** Structural Model Assessment

Table 4. Results of Direct Effect

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
Environmental Protection -> Sustainable Performance	0.6	0.596	0.063	9.493	0
Green Marketing -> Environmental Protection	0.9	0.9	0.048	18.772	0
Green Marketing -> Sustainable Performance	0.47	0.469	0.074	6.335	0
Green Packaging -> Environmental Protection	0.272	0.273	0.095	2.849	0.005
Green Packaging -> Sustainable Performance	0.226	0.224	0.09	2.503	0.013
Green Purchasing -> Environmental Protection	0.234	0.236	0.104	2.252	0.025
Green Purchasing -> Sustainable Performance	0.063	0.065	0.032	1.97	0.05

Table 4. Results of Indirect Effect

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values
Green Packaging -> Environmental Protection -> Sustainable Performance	0.163	0.164	0.063	2.597	0.01
Green Purchasing -> Environmental Protection -> Sustainable Performance	0.14	0.142	0.067	2.088	0.037
Green Marketing -> Environmental Protection -> Sustainable Performance	0.54	0.536	0.06	8.992	0

Moreover, this study addressed the mediation effect of environmental protection. It is found that the mediation effect of environmental protection between green packaging and sustainable performance is significant with t-value 2.597. Furthermore, it is observed that environmental protection has a mediating variable between green purchasing and sustainable performance with t value 2.088. It indicates that environmental protection can transfer the positive effect of green purchasing on sustainable performance which shows that it can transfer the positive effect of green packaging of sustainable performance. Additionally, the mediation effect of environmental protection between green marketing and sustainable performance is also significant with t-value 8.992.

5. Conclusion

Findings of the study highlighted that GSCM practices has vital influence to promote sustainable performance. The sustainable performance of vocational colleges in Thailand can be promoted with the help of implementation of various green supply chain activities. The green supply chain activities have the potential to enhance sustainability in the performance of these educational institution. More specifically, it is observed that green purchasing for the activities of colleges should be based on environmental protection strategies. For example, the use of papers as well as other materials must be environmentally friendly. In addition to this, the green packaging should be used among for environmental protection. Similarly, it is observed from the findings of the study that marketing activities are also important for vocational colleges, however, these activities

must be green and should be environmentally friendly. Therefore, the green marketing activities can help to promote sustainable performance. Hence, the results of the study reported that three green supply chain practices such as green purchasing, green packaging and green marketing has influence on environmental protection which further increases the sustainable performance.

6. Implications

The findings of the study provided several implications for the literature. Most importantly this study is one of the unique studies which tested the relationship between green purchasing, green packaging, green marketing, environmental protection and sustainable performance which is not addressed among the vocational colleges of Thailand. All these elements, most importantly, the sustainable performance is majorly discussed among business industries, however, it is not formally documented in various educational studies. In addition to this, this study also addressed green supply chain among educational institutions which is less addressed by the previous studies. In this way, the current study has vital contribution to the literature which led to the practical implications. Therefore, from the findings of the study, this study recommended to the management of the vocational colleges to promote sustainable performance through protection of environment with the help of green supply chain.

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