

Print ISSN: 1738-3110 / Online ISSN 2093-7717
http://dx.doi.org/10.15722/jds.15.5.201705.17

The Impact of Eco-friendly Management on Product Quality, Financial Performance and Environmental Performance*

Jin-Hee Ma**, Seok-Beom Choi***, Young-Hyo Ahn****

Received: April 7, 2017. Revised: April 20, 2017. Accepted: May 15, 2017.

Abstract

Purpose – Considering the environmental issues in corporate management is now a necessity, not an option. In addition, consumers' interest in health and environment has increased rapidly. This study aims to investigate how the management style that pursues environmental protection affects the various outcomes at each management process such as planning, producing and supervising process.

Research design, data, and methodology – We surveyed 319 manufacturing companies from April 1 to April 30, 2016. Green purchasing, environmental technology management and management support are selected as independent variables and firm performances as dependent variables. Three analyses including factor, regression and moderating were conducted.

Results – Regression analysis was performed to set up hypotheses. Consequently, the total six hypotheses were adopted and then innovative management style showed moderating effect.

Conclusions – Companies should consider environmental factors to improve the financial performance in the long term. Especially the cooperative style enhances financial performance by implementing eco-friendly design in cooperation with customers. Also, eco-friendly activities with suppliers could have direct environmental protection effects. Therefore, a manufacturer needs to cooperate with both suppliers and customers to maximize the protection effect. The production of eco-friendly products and implementing eco-friendly design with customers positively affect product quality.

Keywords: CSR, Manufacturing Company, Eco-friendly Management, Corporate Performance, Regression, Moderating Analysis.

JEL Classifications: C12, C42, D21.

1. Introduction

The concept of CSR has led companies to put responsibility on various stakeholders as a growing awareness of the practical reality of the complex relationship between the company and socio-economic, cultural, economic and natural environments (Hahn & Kim, 2016).

At this point in time, considering the environmental issues in corporate management is now a necessity, not an option.

Companies are moving away from the reactive response to take action on environmental problems after they occur, and are now taking preventative measures to prevent or reduce environmental problems before they occur. The management considering the environment has not suddenly started.

We have been aware of the seriousness of environmental pollution continuously as much as the development of industry. In addition, as consumers' interest in health and environment has increased rapidly, companies have been taking green issues priority into all management processes, from planning and designing eco-friendly products to production and sales to consumers. Therefore, eco-friendly corporate management refers to the introduction of environmental protection concepts into all stages from setting up a company's vision to planning, selling, etc. The purpose of this study is to investigate how the management style that pursues environmental protection affects the various outcomes at each management process such as planning, producing and supervising process.

* This paper has been written in support of research fund of Ministry of Education and National Research Foundation of Korea (KRF-2014S1A2A2028564).

** First Author, Ph.D Candidate, Division of International Trade, Incheon National University, Korea. E-mail: akwsgml@naver.com

*** Corresponding Author, Professor, Department of China Economics and Trade, Cheju Halla University, Korea. E-mail: sbchoi777@naver.com

**** Professor, Division of International Trade, Incheon National University, Korea. Tel: +82-32-835-8545, E-mail: yhahn@inu.ac.kr

Business activities are characterized by being operated in conjunction with many companies organically. For example, a company procures several parts from other suppliers and sells final goods through retailers rather than directly to consumers. Therefore, most companies perform their works with other companies and maintain cooperative relations mutually. In this study, we would like to confirm whether a company that is closely connected with suppliers or customers has an effect of cooperating in environment-friendly management activities.

Many companies around the world are reflecting the concept of environmental protection in their corporate management vision even though the ultimate goal of the enterprise is to create profits (economic value). Corporate management focused on the green can enhance the corporate image and the loyalty of consumers who prefer to buy eco-friendly products. However, at the enterprise level, it is important to know that these outcomes generate profits eventually. Therefore, in this study, we try to find out how the performance of eco-friendly management activities affects on outcomes, such as green performance, financial performance, and product quality enhancement.

2. Literature Research

The impact of environmental management on the performance of the company has been studied for many years. Florida and Davison (2001) found out that environmental management systems would be an effective tool for managing environmental costs and risks inside and outside the factory. Many studies have analyzed the influence of environmental and eco-friendly management on financial performance. However, most of the studies have only identified the positive effects of eco-friendly management on financial performance.

For example, Siegel (2009) argued that firms should adopt "green management" in order to enhance profitability or shareholder wealth. And Improved environmental performance would induce cost savings and increase sales and thus improve economic performance (Schaltegger & Synnsted, 2002). Ali Shirzad et al. (2015) showed that the company's performance-based accruals earnings management, the actual management of profits, and the general level of earnings management had significant inverse relationships.

In addition, companies consider establishment and maintenance of an EMS as key elements of sustainable management tactics (Daily & Huang, 2001) because the environmental practices are positively related to performance through the mediating effect of enhanced customer satisfaction and loyalty (Kassins & Sothriou, 2003). Especially Choi et al. (2014) founded that eco-friendly goods are closely connected to customers' purchasing intention.

Also green managements including saving energy, preventing pollution, green product design and corporate

environmental management contribute to business sustainability because it potentially has a positive effect on a firm's financial, social, and environmental outcomes (Aguilera-Caracuel & Ortiz-de-Mandojana, 2013). And Hofmann et al. (2012) suggest how firms should approach sustainability initiatives by developing support firms' efforts to become 'greener'.

<Table 1> The prior literature on firm performance of eco-friendly management

Performance	Author(s) and year of publication
Finance	Florida & Davison (2001), Siegel (2009), Schaltegger & Synnsted (2002), Ali Shirzad et al. (2015)
Environment	Daily & Huang (2001), Kassins & Sothriou (2003), Choi et al. (2014)
Sustainability	Aguilera-Caracuel & Ortiz-de-Mandojana (2013), Hofmann et al. (2012)

Many studies demonstrated that environmental (green) managements are positively related to some performance such as financial performance and enhanced customer satisfaction and loyalty. And the improved performances result in business sustainability. The firms' efforts to become 'greener' were detailed in some studies.

This study suggests 'green purchasing', 'environmental technology management', 'environmental technology management support' as the efforts to be greener and to have influence on performances. They are detailed to be guideline for managing and operating companies environment-friendly. Therefore, to achieve more improved performance the results of this study show how firms are managed environmentally friendly in detail.

3. Research Model

As the interest in the environment grows, awareness about management considering the environment is spreading at the enterprise level. As a result, companies are setting green targets and implementing detailed plans.

Firms are making a lot of environmental efforts notably in manufacturing and production, perhaps because they have quick and easy access to this sector for environmental protection. For example, it may be possible to consider assessing, supervising and enforcing environmentally friendly activities by procuring raw materials that have been environmentally certified for production and conducting environmental audits of internal environmental management. We call this "green purchasing" in this paper.

In general, corporate management can be roughly divided into direct management and supporting sectors. Therefore, this study also distinguishes the business management from the environmental aspect by environmental technology management and environmental technology management support.

Operating an enterprise in an environmentally friendly way can be said to be the development or enforcement of environmentally friendly technology, which can be seen as a management activity that carries out an overall plan for material saving or invests in eco-friendly facilities or technology. In this study, we refer to this as 'environmental technology management'.

In order for such environmental technology management to be effective and effective, management support must be implemented. Since the management of the company is limited to eco-friendly technology for the purpose of environmental protection, the management support can be seen as the level of support necessary for effective implementation of environmental technology. This includes, for example, the management of documents and information for the implementation of eco-friendly technologies, and the operation of eco-friendly technology supervision and technology transfer systems. This is called 'environmental technology management support'.

In this study, we divide eco-friendly management activities into three areas: 'green purchasing' that covers manufacturing and production, 'environmental technology management' that the overall planning and implementation of corporate management is seen from the perspective of environmental technology, and 'environmental technology management support' that effectively controls environmental technology management. These three eco-friendly management activities are used as independent variables.

The company's financial performance, environmental performance, and product quality are selected and used as dependent variables. We will try to understand how the environmental effort of the company affects the financial, environmental and quality performance.

On the other hand, the environmental effort of a company can be directly or indirectly influenced by various variables in its performance. Therefore, we will try to identify all of the moderating effects by selecting the internal factors that can affect them as variables. Internal factors chosen as moderating variables are: 1. innovative management style; 2. long-term

cooperation with customers in terms of management; and 3. cooperation with the customer in terms of production. This is shown in <Figure 1>.

4. Empirical Analysis

4.1. Factor Analysis

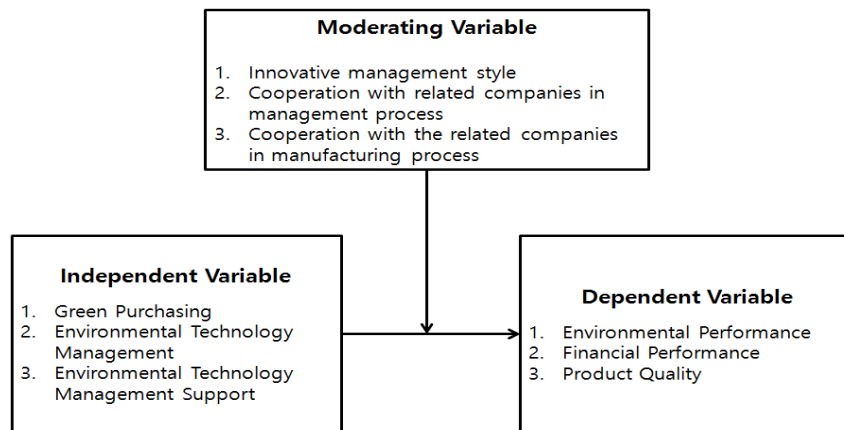
We surveyed 319 manufacturing companies closely related to environment during a month from April 1 to April 30, 2016. They are composed of Food(13), Textile(43), Paper 18), Refining(10), Chemical(23), Medicine(18), Ceramic(12), Metal(28), Machine(24), Electronic and Electrical(59), Transportation of vehicles(15), the Others(58).

Factor analysis is carried out by dividing the variables into independent variables such as green purchasing, environmental technology management and management support, and dependent variables covering firm performances such as environmental performance, financial performance and product quality.

4.1.1. Factor Analysis of Independent Variables

<Table 1> shows the results of factor analysis of independent variables. It is confirmed that each measurement item is bundled into three factors. 2-1, 2-1, 2-2, 2-3, 2-4, 2-5, and 4-1 were tied to factor 1, 4-5, 4-6, 4-7 and 4-2, 4-3, 4-4 were valid for explaining factor 2 and factor 3 respectively.

As a result of factor analysis and factor analysis loadings predicted by the researchers, it was judged that 4-1 loaded with 2-1 to 5 was loaded incorrectly. Therefore, 4-1 was removed. In addition, we decided to increase the validity of the factor by deleting 2-4 (.486), in which the communality that represents the rate of explaining the variables was relatively low for the extracted factors. <Table 2> shows the results of the second factor analysis after removing variables 4-1 and 2-4.



<Figure 1> Research model

As a result, the commonality that shows the degree of explaining the factors was improved to 0.7 or more, and the KMO value was lower than the first factor analysis but still high at 0.878. In addition, the Bartlett test of sphericity had a significance probability of 0.000, which is suitable for factor analysis. Therefore, 2-1, 2-2, 2-3, 2-5, which have a similarity to the predicted factor loadings, are considered as

variables explaining 'green purchasing', 4-5, 4-6, 4-7 are regarded as variables that constitute 'environmental technology management support', and 4-2, 4-3, and 4-4 are variables that designate 'environmental technology management'.

The Cronbach's alpha value, which indicates the reliability of the variable, is also above 0.7, which confirms the reliability and validity of the variable.

<Table 2> Exploratory Factor Analysis of the First Independent variables

No.	Content	Factor		
		1	2	3
a2_2	Work with suppliers for eco-friendly goals	<u>.755</u>	.360	.137
a2_5	Evaluate environmentally friendly activities for secondary suppliers (suppliers' suppliers)	<u>.737</u>	.277	.234
a2_3	Perform environmental audits of suppliers' internal environmental management	<u>.732</u>	.316	.140
a2_1	Procure raw materials with eco-friendly certification	<u>.708</u>	.254	.287
a2_4	Major suppliers have ISO140001 certification	<u>.683</u>	.093	.064
a4_1	When designing a product, consider reuse or recycling of materials or components.	<u>.573</u>	.268	.468
a4_6	Has an eco-friendly technology supervision and technology transfer system	.310	<u>.875</u>	.156
a4_5	Manage documents and information for eco-friendly technologies	.189	<u>.844</u>	.185
a4_7	Perform eco-friendly design in cooperation with customers	.347	<u>.807</u>	.139
a4_4	Invest in environmentally friendly facilities and technologies	-.025	.100	<u>.819</u>
a4_2	When producing products, consider reducing or avoiding the occurrence of hazardous substances.	.414	.154	<u>.714</u>
a4_3	Make overall plan for material saving	.465	.229	<u>.636</u>

KMO: .898 , Bartlett's Test of Sphericity Approx. Chi-Square: 2187.436, df: 66 , Sig.: .000

<Table 3> Exploratory Factors and Reliability Analysis of Final Independent variables

No.	Content	Commonality	Factor			α
			1	2	3	
a2_2 (Green purchasing2)	Work with suppliers for eco-friendly goals	.791	<u>.826</u>	.309	.116	.873
a2_1 (Green purchasing1)	Evaluate environmentally friendly activities for secondary suppliers (suppliers' suppliers)	.722	<u>.783</u>	.203	.262	
a2_3 (Green purchasing3)	Perform environmental audits of suppliers' internal environmental management	.701	<u>.777</u>	.279	.136	
a2_5 (Green purchasing4)	Procure raw materials with eco-friendly certification	.657	<u>.726</u>	.276	.231	
a4_6 (Environmental technology management support2)	Has an eco-friendly technology supervision and technology transfer system	.887	.326	<u>.871</u>	.149	0.737
a4_5 (Environmental technology management support1)	Manage documents and information for eco-friendly technologies	.787	.196	<u>.847</u>	.180	
a4_7 (Environmental technology management support3)	Perform eco-friendly design in cooperation with customers	.796	.352	<u>.808</u>	.138	
a4_4 (Environmental technology Management3)	Invest in environmentally friendly facilities and technologies	.665	.002	.090	<u>.811</u>	0.889
a4_2 (Environmental technology Management1)	When producing products, consider reducing or avoiding the occurrence of hazardous substances.	.716	.421	.155	<u>.718</u>	
a4_3 (Environmental technology Management2)	Make overall plan for material saving	.694	.417	.257	<u>.674</u>	

KMO: .878 , Bartlett's Test of Sphericity Approx. Chi-Square: 1835.667, df: 45, Sig.: .000

4.1.2. Factor Analysis of Dependent Variables.

We selected financial performance, environmental performance, product quality and employee morale as dependent variables. <Table 4> shows the results of factor analysis for the detailed factors of each dependent variable.

The KMO value is 0.843 and the Bartlett test of sphericity had a significance probability of 0.000, which is suitable for factor analysis. And the commonality of the variables is all above 0.7, which makes the explanatory power and validity of the variables high. However, in spite of the fact that employee morale 1 and product quality are variables of different concepts, the fact that two variables are the same factor means that there is a conflict of validity in explaining the concept of two variables. Therefore, we choose to eliminate employee morale 1 (0.776), which has lower commonality than product quality (0.789). Thus, employee morale 1 was deleted and the factor analysis of dependent

variables was performed again. The results are shown in <Table 5>.

In the case of dependent variables, factor analysis is not usually carried out. However, in this study, as we distinguish the details of performance under a big concept, there should be a correlation between the details. Therefore, we conducted a factor analysis by judging that there should be a common concept to explain and construct the big concept.

As a result, KMO is 0.843, which is higher than the first factor analysis. It is found that the explanatory power of the variables is higher and Bartlett's Test of Sphericity has a significance of 0.000, indicating that the results of the factor analysis are appropriate.

In addition, except for environmental performance 1 (0.774) and environmental performance 3 (0.786), the variables were more than 0.8, indicating that the variables are well suited for constructing these factors.

<Table 4> Exploratory factor analysis of the first dependent variable

No.	Content	Factor			
		1	2	3	4
Environmental Performance 2	Reduced use of hazardous, toxic and hazardous substances	<u>.854</u>	.255	.136	.028
Environmental Performance 3	Reduced the incidence of environmental accidents	<u>.788</u>	.186	.303	.086
Environmental Performance 1	Reduction in greenhouse gas, waste water or waste emissions in recent years	<u>.735</u>	.308	.107	.094
Financial Performance 1	Expected to reduce operating costs in the long run	.250	<u>.871</u>	.176	.150
Financial Performance 2	Expected to improve corporate financial performance in the long term	.416	<u>.792</u>	.165	.057
Employee Morale 1	Increased employee satisfaction	.104	.093	<u>.790</u>	.362
Product Quality	Improved product quality	.337	.249	<u>.775</u>	-.111

KMO: .836, Bartlett's Test of Sphericity Approx. Chi-Square: 996.341, df 28, Sig. .000

<Table 5> Exploratory factor analysis of final dependent variables

No.	Content	Commonality	Factor			α
			1	2	3	
Environmental Performance2	Reduced use of hazardous, toxic and hazardous substances	.801	<u>.814</u>	.247	.275	.818
Environmental Performance1	Reduced the incidence of environmental accidents	.774	<u>.811</u>	.339	.003	
Environmental Performance3	Reduction in greenhouse gas, waste water or waste emissions in recent years	.786	<u>.679</u>	.165	.521	
Financial Performance1	Expected to reduce operating costs in the long run	.872	.222	<u>.870</u>	.200	.819
Financial Performance2	Expected to improve corporate financial performance in the long term	.833	.402	<u>.794</u>	.193	
Product Quality	Improved product quality	.920	.188	.240	<u>.908</u>	-

KMO: .843, Bartlett's Test of Sphericity Approx. Chi-Square: 892.673, df 21 Sig.: .000

4.2. Multiple Regression Analysis

As shown in the initial research model of <Figure 2> and <Figure 3>, independent variables, 10 sub-variables, 4 dependent variables and 7 sub-variables are the framework of the basic research model. Regression analysis is commonly used to examine the causality of multiple independent variables with one dependent variable. In this study, at first, we conducted multiple regression analysis between independent and dependent variables except for moderating variables because we wanted to investigate the relationship between multiple independent variables and multiple dependent variables.

4.2.1. Regression on Environmental Performance as a Dependent Variable

Environmental performance is explained by three factors. Environmental performance 1 indicates that greenhouse gas, wastewater or waste emissions have declined in recent years, environmental performance 2 indicates a decrease in the use of hazardous / toxic / hazardous materials, and environmental performance 3 means the achievement of a reduction in the incidence of environmental accidents.

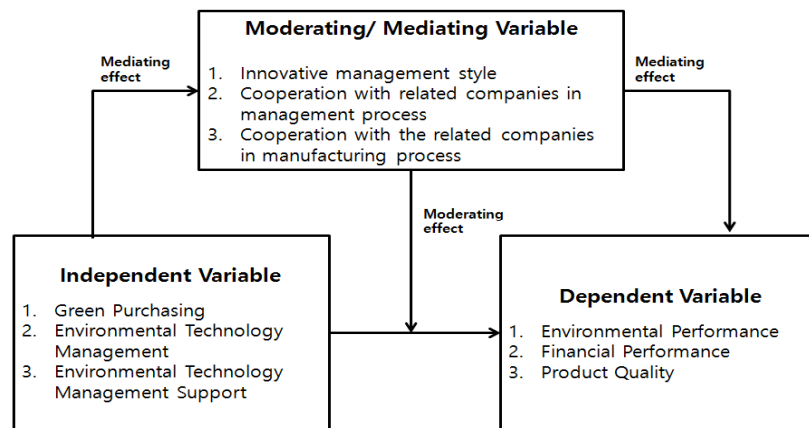
<Table 5> shows the causal relationship between

independent variables, green purchasing, environmental technology management, environmental technology management support and dependent variable, environmental performance. According to the results of the analysis, green purchasing 4 and environmental technology management support 3 were found to affect environmental performance. The correlation coefficient between the independent variable and the dependent variable (environmental performance 2) is 0.426 and Independent variable explains 18.2% of environmental performance 2.

Durbin-Watson is 1.864, close to the reference value of 2 and not close to 0 or 4, so it is judged that there is no correlation between the residuals. Also, since the tolerance limits are all greater than 0.1, there is no problem with multi-collinearity. Therefore, the regression model is appropriate and the following hypotheses are tested according to the results of multiple regression analysis.

<Hypothesis 1> Assessing eco-friendly activities for secondary suppliers has a positive effect on reducing the use of hazardous / toxic / hazardous materials.

<Hypothesis 2> Cooperating with customers to implement eco-friendly design has a positive effect on reducing the use of hazardous / toxic / hazardous materials.



<Figure 2> Early research model

<Table 6> Regression analysis between independent variables and environmental performance

Dependent Variable	Independent Variable	Standard Error	Standardized β	t-value	p-value	Tolerance Limit
Environmental Performance1	Constant	.279		7.613	.000	
	Green purchasing1(2-1)	.076	.141	1.673	.095	.419
	Green purchasing2(2-2)	.076	-.010	-.105	.916	.356
	Green purchasing3(2-3)	.069	.001	.010	.992	.457
	Green purchasing4(2-5)	.068	-.029	-.368	.713	.482
	Environmental technology management1(4-2)	.082	.076	.917	.360	.434
	Environmental technology management2(4-3)	.084	.081	.963	.336	.414
	Environmental technology management3(4-4)	.063	.073	1.207	.228	.811
	Environmental technology management support 1(4-5)	.069	.071	.850	.396	.429

Dependent Variable	Independent Variable	Standard Error	Standardized β	t-value	p-value	Tolerance Limit
	Environmental technology management support 2(4-6)	.090	-.098	-.890	.374	.244
	Environmental technology management support 3(4-7)	.076	.087	.908	.365	.325
	R=.297, Adjusted=0.059, F=87.007, p=.001, Durbin-Watson=1.848					
Environmental Performance2	Constant	.267		6.652	.000	
	Green purchasing1(2-1)	.073	-.034	-.432	.666	.419
	Green purchasing2(2-2)	.072	.043	.493	.622	.356
	Green purchasing3(2-3)	.066	-.053	-.696	.487	.457
	Green purchasing4(2-5)	.065	.297	3.998	.000**	.482
	Environmental technology management1(4-2)	.078	.144	1.835	.067	.434
	Environmental technology management2(4-3)	.080	-.007	-.085	.932	.414
	Environmental technology management3(4-4)	.060	.061	1.069	.286	.811
	Environmental technology management support 1(4-5)	.066	-.012	-.155	.877	.429
	Environmental technology management support 2(4-6)	.086	-.113	-1.082	.280	.244
	Environmental technology management support 3(4-7)	.073	.186	2.057	.040*	.325
R=.426, Adjusted=0.155, F=83.208, p=.000, Durbin-Watson=1.864						
Environmental Performance3	Constant	.278		6.862	.000	
	Green purchasing1(2-1)	.076	.015	.177	.860	.419
	Green purchasing2(2-2)	.075	.008	.085	.933	.356
	Green purchasing3(2-3)	.069	.056	.706	.481	.457
	Green purchasing4(2-5)	.068	.064	.837	.403	.482
	Environmental technology management1(4-2)	.081	.135	1.659	.098	.434
	Environmental technology management2(4-3)	.084	.015	.178	.859	.414
	Environmental technology management3(4-4)	.063	.049	.832	.406	.811
	Environmental technology management support 1(4-5)	.068	.061	.741	.459	.429
	Environmental technology management support 2(4-6)	.089	.013	.120	.905	.244
	Environmental technology management support 3(4-7)	.075	.065	.692	.489	.325
R=.345, Adjusted=0.091, F=86.493, p=.000, Durbin-Watson=1.792						

*.p<0.05, **.p<0.01

4.2.2. Regression on Financial Performance as a Dependent Variable

<Table 7> shows the independent variables that affect each financial performance. Financial Performance 1 represents long-term performance that lowers operating costs, while financial performance 2 represents long-term performance that enhances a company's financial performance. Each regression model for financial performance 1 and financial performance 2 is appropriate because the R value is 0.509 and 0.470 respectively, and Durbin-Watson is 1.928 and 1.859 respectively.

Under the statistical significance level, environmental management technical support 2 affects financial performance 1, and environmental management technical support 3 affects financial performance 2. Therefore, two

hypotheses were adopted.

- <Hypothesis 3> Having a system that oversees eco-friendly technology and transfers technology has a positive effect on lowering operating costs in the long term.
- <Hypothesis 4> Implementing eco-friendly design in cooperation with customers has a positive effect on improving corporate financial performance in the long run.

<Table 7> Regression analysis between independent variables and financial performance

Dependent Variable	Independent Variable	Standard Error	Standardized β	t-value	p-value	Tolerance Limit
Financial Performance 1	Constant	.279		6.330	.000	
	Green Purchasing1(2-1)	.076	.021	.277	.782	.419
	Green purchasing2(2-2)	.076	-.038	-.460	.646	.356
	Green purchasing3(2-3)	.069	.013	.173	.863	.457
	Green purchasing4(2-5)	.068	.027	.376	.707	.482
	Environmental technology management1(4-2)	.082	.090	1.209	.228	.434
	Environmental technology management2(4-3)	.084	-.073	-.957	.339	.414
	Environmental technology management3(4-4)	.063	-.023	-.430	.668	.811
	Environmental technology management support 1(4-5)	.069	.073	.980	.328	.429
	Environmental technology management support 2(4-6)	.090	.321	3.233	.001**	.244
	Environmental technology management support 3(4-7)	.076	.139	1.621	.106	.325
	R=.509, Adjusted=0.235, F=87.079, p=.000, Durbin-Watson=1.928					
Financial Performance 2	Constant	.292		6.170	.000	
	Green purchasing1(2-1)	.080	.042	.537	.591	.419
	Green purchasing2(2-2)	.079	-.024	-.287	.774	.356
	Green purchasing3(2-3)	.072	.063	.850	.396	.457
	Green purchasing4(2-5)	.071	.027	.369	.712	.482
	Environmental technology management1(4-2)	.085	.111	1.459	.146	.434
	Environmental technology management2(4-3)	.088	-.029	-.368	.713	.414
	Environmental technology management3(4-4)	.066	-.076	-1.364	.174	.811
	Environmental technology management support 1(4-5)	.072	.046	.598	.550	.429
	Environmental technology management support 2(4-6)	.094	-.110	-1.084	.279	.244
	Environmental technology management support 3(4-7)	.079	.440	4.993	.000**	.325
	R=.470, Adjusted=0.195, F=90.990, p=.000, Durbin-Watson=1.859					

*.p<0.05, **.p<0.01

4.2.3. Regression on Product Quality as a Dependent Variable

<Table 8> shows the results of the regression analysis of the dependent variables, product quality and independent variables: green purchasing, environmental technology management, and environmental technology management support. As a result, environmental technology management 1 and environmental technology management support 3 have a positive effect on product quality.

<Hypothesis 5> Considering the reduction or non-occurrence of harmful substances when producing products positively affects product quality.

<Hypothesis 6> Conducting eco-friendly design in cooperation with customers positively affects product quality.

The effects of independent variables on dependent variables must be significant to determine moderating effects. Accordingly, empirical analysis using moderating effects is based solely on hypotheses adopted in <Table 9>.

<Table 8> Regression analysis between independent variables and product quality

Dependent Variable	Independent Variable	Standard Error	Standardized β	t-value	p-value	Tolerance Limit
Product quality	Constant	.266		7.543	.000	
	Green purchasing1(2-1)	.073	-.051	-.647	.518	.419
	Green purchasing2(2-2)	.072	-.012	-.138	.890	.356
	Green purchasing3(2-3)	.066	.086	1.152	.250	.457
	Green purchasing4(2-5)	.065	-.041	-.559	.577	.482
	Environmental technology management1(4-2)	.078	.368	4.799	.000**	.434
	Environmental technology management2(4-3)	.080	-.070	-.892	.373	.414
	Environmental technology management3(4-4)	.060	.018	.316	.752	.811
	Environmental technology management support1 (4-5)	.065	-.113	-1.467	.143	.429
	Environmental technology management support 2(4-6)	.086	-.037	-.364	.716	.244
	Environmental technology management support 3(4-7)	.072	.337	3.805	.000**	.325
	R=.461, Adjusted=0.187, F=83.005, p=.000, Durbin-Watson=1.922					

*.p<0.05, **.p<0.01

<Table 9> Adopted Hypothesis

No.	independent Variable	→	Dependent Variable	
1.	Green purchasing4	→	Environmental Performance2	adopted
	Assessing eco-friendly activities for secondary suppliers has a positive effect on reducing the use of hazardous / toxic / hazardous materials.			
2.	Environmental technology management support 3	→	Environmental Performance2	adopted
	Cooperating with customers to implement eco-friendly design has a positive effect on reducing the use of hazardous / toxic / hazardous materials.			
3.	Environmental technology management support 2	→	Financial Performance 1	adopted
	Having a system that oversees eco-friendly technology and transfers technology has a positive effect on lowering operating costs in the long term.			
4.	Environmental technology management support 3	→	Financial Performance 2	adopted
	Implementing eco-friendly design in cooperation with customers has a positive effect on improving corporate financial performance in the long run.			
5.	Environmental technology management1	→	Product quality	adopted
	Considering the reduction or non-occurrence of harmful substances when producing products positively affects product quality.			
6.	Environmental technology management support 3	→	Product quality	adopted
	Conducting eco-friendly design in cooperation with customers positively affects product quality.			

4.3. Moderating Effect

In the previous section, the company's environment-friendly management activities were classified as purchasing, management, and management support, and were selected as independent variables and we examined the effects of these environmental activities on environmental performance, financial performance, product quality, and employee morale.

However, it can not be overlooked that other external factors can change the impact of environmentally friendly

management activities on performance. Therefore, we would like to examine the moderating effect of the company's environment-friendly management activities on corporate performance by selecting other factors related to the company as moderating variables. Moderating variables include innovative management style, cooperation with customers in terms of management, cooperation with customers in terms of production. The description of the moderating variable is shown in <Table 10>.

<Table 10> Moderating Variable

Moderating Variable	No.	Content
Innovative management style	19-2	Our management style attaches great importance to personal adventure and emphasizes innovation, personal freedom and uniqueness.
Cooperation with customers in terms of management	28-1	Our company has long-term cooperation with our customers (strategic cooperation)
Cooperation with customers in terms of production	3-1	Our company collaborates with customers for clean production (for example, using less harmful raw materials in production)

<Table 11> The results of the moderating effect test for the hypotheses

Moderating variable	Hypo 1	Hypo2	Hypo 3	Hypo 4	Hypo 5	Hypo 6
	p-value	p-value	p-value	p-value	p-value	p-value
Innovative management style	.000	.000	.000	.000	.000	.000
	.005	.027	.000	.001	.002	.016
	.329	.877	.132	.029	.687	.287
Cooperation with customers in terms of management	.000	.000	.000	.000	.000	.000
	.394	.511	.520	.904	.071	.095
	.231	.061	.129	.052	.427	.404
Cooperation with customers in terms of production	.000	.000	.000	.000	.000	.000
	.045	.000	.048	.583	.067	.021
	.641	.109	.609	.412	.589	.933

4.3.1. The Results of the Moderating Effect Test for the Hypotheses

<Table 11> shows the moderating effect on whether a company's challenging and innovative management style, mutual cooperation with customers, and cooperation with customers for environmental production affect <Hypothesis 1>.

The moderating effect analysis is conducted through steps 1, 2, and 3, and moderating effect is obtained if the explanatory power is significantly increased under the significance level when the interaction (independent variable*moderating variable) is added to the regression equation in the third step. Thus, even if the first and second stages are significant, the moderating variable does not have a moderating effect on the independent variable-dependent variable if the third stage exceeds the significance level or the explanatory power does not increase even on the significant probability.

For <Hypothesis 1> (green purchasing 4 - environmental performance 2), no variables showed moderating effect. However, paradoxically, this means that sustainable environmental activities for secondary suppliers, regardless of co-operation or management style, can reduce the use of hazardous / toxic / hazardous materials.

As the moderating effect analysis needs to satisfy all three stages step by step, there is no moderating variable acting on the <Hypothesis 2> according to the result of the table. Also there is no moderating variable satisfying <Hypothesis 3>.

And the <Table 11> shows the results of the moderating effect analysis of <Hypothesis 4>; cooperating with customers to implement eco-friendly design has a positive effect on improving corporate financial performance over the long term. The firm's challenging and innovative management style seems to have a moderating effect in <Hypothesis 4> due to the increase in under the significant level.

Therefore, the management style that emphasizes individual adventure, innovation, freedom and uniqueness will play a role in enhancing corporate financial performance through eco-friendly design in cooperation with customers. In addition, mutual cooperation with customers is significantly increased under <Hypothesis 4> at the significance level. Therefore, mutual cooperation with customers in the managerial perspective has a moderating effect on enhancing the financial performance through the implementation of green design. In other words, strengthening partnership with customers in eco-friendly design can improve financial performance more efficiently.

On the other hand, it can be seen that the use of less hazardous raw materials for clean production, for example, does not show a moderating effect on enhancing financial performance due to eco-friendly design with customers. In general, the cost is high when using less harmful and environmentally friendly raw materials. Using and cooperating with eco-friendly raw materials can have a negative impact on financial performance, and green design and financial performance can be irrelevant.

Consideration of the reduction or non-occurrence of harmful substances when producing products positively affects product quality. Conducting eco-friendly design in cooperation with customers positively affects product quality.

5. Conclusion

5.1. Summary

In order to improve the financial performance of the company in the long term, management should be carried out in consideration of environmental factors such as development of environmentally friendly technologies and supervision. Specifically if the companies have a system that oversees eco-friendly technology and transfers that technology, it is expected that the cost of operation will be lowered in the long view. Also if design eco-friendly products with customers, they will improve corporate financial performance.

This means that it is necessary to establish a long-term cooperation with customers in order to improve financial performance. Therefore, we seek to prove which kind of partnership with customers affects the improvement of financial performance. As a result, it has been shown that the corporate management style that is challenging, innovative, free and adventurous has a moderating effect in enhancing corporate financial performance through eco-friendly design cooperation with customers.

In addition, the reciprocal relationship conducting, monitoring and evaluating eco-friendly activities between the secondary supplier and the party could have direct environmental protection effects. Cooperation putting greater priority on environmental protections with suppliers is a direct environmental safeguard because it avoids the use of hazardous, toxic and hazardous substances in the manufacturing process. And building close relationship with customers in a design work can have a direct environmental protection effect as well. Therefore, both cooperation with suppliers and customers are needed to maximize the environmental protection effect.

Also, considering that the generation of harmful substances is reduced or not occurred in the production stage has a positive effect on product quality. Therefore, if the company cooperates with secondary suppliers to conduct and evaluate eco-friendly activities mentioned as a way to reduce harmful substances in product production stage, it can reduce hazardous substances and improve product quality. And the production of eco-friendly products positively affects product quality. Also, implementing eco-friendly design in cooperation with customers has a positive effect on product quality. Therefore, a way to protect the environment and improve the product quality is to implement eco-friendly design on the product. This can raise awareness of environmental protection and enhance product quality positively.

Therefore, the development and implementation of eco-friendly product design and eco-friendly production of goods will be a way to achieve both the moral purpose of environmental protection and the commercial purpose of increasing product quality.

5.2. Implications

It is found that the management of the company focusing on the environment affects financial performance, product quality improvement and environmental protection. Therefore, the enterprise's efforts to protect the environment are now necessarily integrated with corporate social responsibility (CSR) to create long-term corporate economic profit. In particular, it can be seen that the efforts of one company are insufficient. The outcomes can be obtained only when the environmental responsibility among the various companies is shared and they cooperate to achieve the goals concerned about the environment. In recent years, production plants, suppliers, and customers have been distributed all over the world to the extent that the concept of a national company is no longer available. Therefore environmental responsibility cannot be achieved by only one company, and all companies around the world should be interested in environmental issues.

5.3. Limitations and Future Task

In the initial research model, we tried to see the mediating effects as well as the moderating effects, but the results of the mediating effects were not significant during the research process. In addition, the results of the analysis to find out the moderating effects were unsatisfactory because there were few significant findings and there was a slight difference from what was predicted in the research plan stage.

In this study, we have differentiated from the existing research by different measurement variables. However, it can not be said that the theoretical explanations of the variables can not be sufficiently explained in the existing studies. Therefore, hypotheses are difficult to explain logically based on existing studies.

However, this study surveyed 319 manufacturers of various industries to examine the performance (financial performance, management performance, and product quality) of each process by subdividing environmentally friendly management. In addition, considering the current situation of companies, it is meaningful to examine the effect of environmentally friendly management by cooperation with customers and suppliers connected with one company. We plan to continue our research by adding performance to the human resources that make up the company in the future. For example, we would like to conduct additional studies by considering the effects of environment-conscious management on the work, morale, and attitude of employees as a result.

References

- Aguilera-Caracuel, J., & Ortiz-de-Mandojana, N. (2013). Green Innovation and Financial Performance: An Institutional Approach. *SAGE Journals*, 26(4), 365–385.
- Ali Shirzad, S. M., & Ryhaneh, H. (2015). Effect of Financial Performance on Earnings Management in the Drug Distribution Industry. *International Journal of Industrial Distribution & Business*, 6(4), 23-26.
- Babiak, K., & Trendafilova, S. (2011). CSR and Environmental Responsibility: Motives and Pressures to Adopt Green Management Practices. *ISI Journal Citation Reports*, 18(1), 11–24.
- Choi, B. N., Lee, H. H., & Yang, H. C. (2014). Impacts of Value Inclination and Self-Expressive Consuming Propensity upon Eco-Friendly Product Purchasing Intention. *The East Asian Journal of Business Management*, 4(4), 39-49.
- Daily, B. F., & Huang, S. C. (2001). Achieving Sustainability through Attention to Human Resource Factors in Environmental Management. *International Journal of Operations & Production Management*, 21(12), 1539–1552.
- Florida, R., & Davison, D. (2001). Gaining from Green Management: Environmental Management Systems Inside and Outside the Factory. *California Management Review*, 43(3), 64-84.
- Green, K. W. Jr., Zelbst, P. J., Meacham, J., & Bhadauria, V. S. (2012). Green Supply Chain Management Practices: Impact on Performance. *Supply Chain Management: An International Journal*, 17(3), 290–305.
- Hahn, Y. A., & Kim, D. H. (2016). Corporate Social Responsibility: A Comparison Analysis. *The East Asian Journal of Business Management*, 6(4), 13-17.
- Hofmann, K. H., Theyel, G., & Wood, C. H. (2012). Identifying Firm Capabilities as Drivers of Environmental Management and Sustainability Practices—Evidence from Small and Medium-Sized Manufacturers. *Business Strategy and the Environment*, 21(8), 530–545.
- Kassins, G. I., & Sothriou, A. C. (2003). Greening the Service Profit Chain: The Impact of Environmental Management Practices. *Production and Operations Management*, 12(3), 386–403.
- Klassen, R. D., & McLaughlin, C. P. (1996). The Impact of Environmental Management on Firm Performance. *Management Science*, 42(8), 1199–1214.
- Lee, K. H. (2009). Why and How to Adopt Green Management into Business Organizations?: The Case Study of Korean SMES in Manufacturing Industry. *Management Decision*, 47(7), 1101–1121.
- Palmer, M., & Truong, Y. (2017). The Impact of Technological Green New Product Introductions on Firm Profitability. *Ecological Economics*, 136, 86-93.
- Rao, P., & Holt, D. (2005). Do green supply chains lead to competitiveness and economic performance?. *International Journal of Operations & Production Management*, 25(9), 898–916.
- Schaltegger, S., & Synnestved, T. (2002). The Link between 'Green' and Economic Success: Environmental Management as the Crucial Trigger between Environmental and Economic Performance. *Journal of Environmental Management*, 65(4), 339-346.
- Siegel, D. S. (2009). Green Management Matters Only If It Yields More Green: An Economic/Strategic Perspective. *Academy of Management Perspectives*, 23(3), 5-16.