



## Green Supply Chain Management Practices' Effect on the Performance of Turkish Business Relationships

Mohammad Hossein Zavvar Sabegh<sup>a</sup>, Yucel Ozturkoglu<sup>b\*</sup>, Taebok Kim<sup>c</sup>

<sup>a</sup>*Department of Industrial Engineering, Faculty of Engineering, Kharazmi University, Tehran, Iran*

<sup>b</sup>*Faculty of Economics and Administrative Sciences, International Logistics Management, Yasar University, Izmir, Turkey*

<sup>c</sup>*Graduate School of Logistics, Incheon National University, Songdo-Dong, Yeonsu-Gu, Incheon, Republic of Korea*

### Abstract

This paper provides a first-hand understanding about the procedures taken by Turkish business firms and their logistics providers and supply chain business firms to operate in an environmentally friendly supply chain. The main point of the study is to examine the influence of both external and internal parties on green supply chain management (GSCM) practices in business firms. The result of this research is very important to promote performance of Turkish business relations in their green perspectives. In order to find the correct answers, comprehensive questionnaire forms were designed. We collected data from 2014 May to 2015 July through Turkish companies. More than 180 companies contributed in this extensive research. Then the derived data were analyzed using statistical methods. One of the important inferred results is that the third party logistics service providers influence firms to have a proactive green behavior.

**Keywords:** Green supply chain management; Turkish companies; Statistical methods; performance of Turkish business relationships.

---

Corresponding's author email address: yucel.ozturkoglu@yasar.edu.tr

## **1. Introduction**

Becoming green is a never ending debate between the competitors of any firms, especially in the last decade. Applying green supply chain practices rather than traditional ones can help organizations to develop win-win strategies which assist them to reach profit and market share objectives by lowering their environmental risks and impacts, while raising their ecological efficiency (Zhu, Q., et al. 2007). Green supply chain management (GSCM) can be defined as integrating environmental issues into supply-chain management, including the processes from product design to end-of-life management of the product after its useful life (Aksoy, A., et al. 2014). There are different motivators and actors encouraging companies to switch to 'green' in their supply chain (Rostami-Fard, M., et al. 2014). Supply chains strive to maintain their internal health and environmental sustainability using the capability of self-correction based on information from the external environment (Kenneth, W., et al. 2012). The external forces like government rules, society, customers, third parties and the partnership of the firms motivate firms to apply the green practices in their supply chain (Ball, A. and Craig, R., 2010) and (Zhu, Q. and Liu, Q., 2010). On the other hand internal forces like stakeholder pressures are also considered to be the principal drivers of green efforts (Foerstl, K., et al. 2015). But it is still unclear how external and internal drivers effect GSCM practices.

The institutional theory determines how external forces influence organizational actions (Lai, K.H., et al. 2006). GSCM practices are a kind of organizational action that reduce environmental impact while flow products and services from origin to end customers. The theory explains the external drivers as government, the important customers and partnerships (Sarkis, J., et al. 2011). So there can be a connection between GSCM practices and institutional theory.

In this research, we make some important contributions: Firstly, we examine how external and internal drivers promote GSCM practices based on institutional theory. Secondly, we determine to find the major driver of GSCM practices. After a brief review on the literature, we realized that very few studies have just concentrated on manufacturing firm's GSCM practices all around the world. The Body Shop, British Telecom, Nissan, Nortel, Yorkshire and Humberside are the well-known manufacturing companies that implement green supply chain (Preuss, L., 2001). When we categorized the studies based on countries, again very limited studies was found; in the UK, B2B supply chains are increasingly demanding green performance from their suppliers (Hoejmose, S., et al. 2012). Another research showed that Indian manufacturing companies have accepted the positive impact of GSCM practices in terms of business and environmental performance of their firms (Dubey, R., et al. 2015). The linkage between corporate environmental strategies and stakeholder management has been evaluated with an empirical application in Belgium manufacturing firms (Buyse, K. and Verbeke, A., 2003). Another research showed us, based on the data collected from Jordan, the internal environmental management has a significant effect on the green supply chain performance (Al Khattab, S.A. and As'ad, H., 2015).

In that view, empirically researches about manufacturing companies are still limited. Our other motivation is our data sample which has been collected from Turkey's manufacturing firms. To the best of our knowledge, the literature just analyzed the manufacturing companies' green actions

however there is still lack of information about logistic services provider's pressure on GSCM practices. Logistics service providers are the main actors that should play a leading role in environmental protection and green issues. The logistics companies need to take into account environmental protection issues in addition to the standard logistics imperatives for efficient, effective, and fast handling and movement of goods (Lin, C.Y. and Ho, Y.H., 2011).

In order to fill the gaps between mentioned topics, this research aims to study the external and internal actor's effects on the adoption of GSCM practices for both manufacturing companies and logistics providers.

The rest of this paper is organized as follows: Section 2 describes problem definition, Section 3, proposes results and analysis of this research. Section 4, conclusion, contains discussion and future research directions.

## **2. Methodology**

### ***Data Collection***

The study is concerned with the phenomena of GSCM so the main aim of this paper is to determine differences between the service and production companies' perception of GSCM practices in reality. The study was carried out in Turkey. Turkey has signed the Kyoto Protocol ten years ago and will start to apply Kyoto Protocol's rules after 2014. So the green practices are getting more important than before. Furthermore, Turkish companies needs to promote their business relationships with international companies and GSCM can help them in this way.

As the study is about measuring green efficiency of the supply chains, the population included different sectors of both manufacturing companies and logistics service providers. In this regard, a self-administrated questionnaire was developed. The questionnaire forms are added to Appendix. A. This questionnaire tried to measure firm's commitment to operate as an environmentally friendly firm. The survey was divided into two sections. In the first part, companies have to report a number of the firm's basic facts. In the second part, companies report the firm's measures that have been taken for implementing green supply chain practices, what kind of effect they have had on firm's performance, level of dependence and trust between firm and its important customers, whether firm has made any special investments to implement green supply chain management (GSCM) practices and have started innovative measures with its important customers or not. The questionnaire was sent via email to the profit-organizations. From the target sample of 200 questionnaires, only 181 completed questionnaires were returned from 2014 May to 2015 July. Respondents of the survey were obligated to consider at least 5 years' experience in the supply chain departments of the companies. The questionnaires were completed voluntarily by all respondents. A five-point Likert scale was used for data collection with different meanings such as 1, being strongly disagreed at all and 5, being strongly agree. IBM SPSS Statistics 20 for Windows was employed in order to obtain the results.

In this research, we have a main and sub hypothesizes to analyze the GSCM practices.

H<sub>1</sub>: There is a significant difference in perception of GSCM practices between service and production sectors Based on that question, we divided our population into two groups; logistics and manufacturing sector.

In addition to descriptive statistics, t-test was used to analyze hypothesizes.

**Analysis**

Firstly, descriptive analyses were conducted. The age range of the firms was 2-94 years with a mean 20. 81. Among them, 22% were 2-10 years, 34.8% were 11-20 years, 30.2 % were 20-38 years and 13% were 38-94 years old. The main business activity of the firms was manufacturing (73.7%) followed by the service sector (Logistics 25.3% and Tourism 1%). Based on the full time employee measure, 7.8% had less than 14 employees, 32.5% had 15-28 employees, 41.2% 29-100 employees, %14.6 101-749 employees, and 3.9% had more than 750 employees in their firm. 71.3% of the firms worked with local customers and 28.7% of the firms worked with international customers. The overall reliability of the scale got acceptance due to the amount of alpha coefficient with 0.926 confidence level.

In the following sections, we have analyzed the statistical significance in perceptions of asked questions for two distinctive groups (i.e., Logistics Company and manufacturing company). As you can find, the independent t-tests were performed using SPSS statistical package (Version 20). The shaded areas are statistically significant with a 95% confidence interval (i.e.,  $\alpha=0.05$ ) in the mean value of collected data for each equation about two distinctive groups (i.e., “L” for logistics company, “M” for manufacturing company). Above all, it could be a reasonable statement on the degree of business dependency between target companies and their customer.

**Table 1.** Statistical analyses for the degree of customer’s dependency on Target Company

Group Statistics					
	Group	N	Mean	Std.Deviation	Std. Error Mean
6-1	L	43	3.70	1.166	.178
	M	138	3.26	1.395	.119
6-2	L	43	3.42	1.159	.177
	M	138	3.80	1.088	.093
6-3	L	43	3.12	1.117	.170
	M	138	2.86	1.233	.105
6-4	L	43	3.47	1.334	.203
	M	138	3.10	1.379	.117

As seen in Table 1, both group of target companies have the same idea about the customer’s dependency on themselves; there is no statistical difference in results.

**Table 2.** Statistical analyses for the degree of company’s dependency on customer

Group Statistics					
Group	N	Mean	Std.Deviation	Std. Error Mean	
7-1	L	43	3.40	1.218	.186
	M	138	3.32	1.039	.088
7-2	L	43	3.05	1.308	.200
	M	138	2.80	1.122	.095
7-3	L	43	3.63	1.113	.170
	M	138	3.30	1.130	.096
7-4*	L	43	3.65	1.066	.163
	M	138	3.09	1.162	.099

\*: Statistically significant at a significant level of  $\alpha=0.05$

However, as seen in Table 2, a group of logistics companies strongly think that they have no substitutable customer and the result is a higher dependency on their customers.

**Table 3.** Statistical analyses for the degree of feeling about the customer

Group Statistics					
Group	N	Mean	Std.Deviation	Std. Error Mean	
8-1*	L	43	4.07	.961	.147
	M	138	3.59	1.254	.107
8-2	L	43	4.28	.882	.134
	M	138	4.33	.794	.068
8-3	L	43	4.02	.913	.139
	M	138	4.06	.926	.079
8-4	L	43	3.88	1.258	.192
	M	138	4.07	1.020	.087

\*: Statistically significant at a significant level of  $\alpha=0.05$

In addition, as seen in Table 3, a group of logistics companies tends to believe that their customers are more sincere with them compared with a group of manufacturing companies.

Table 4 shows the statistical analyses of the question on the external green actions for building close cooperation with customers for both groups, i.e., question 2 in Appendix. A.

**Table 4.** Statistical analyses for the degree of close cooperation with customer

Group Statistics					
	Group	N	Mean	Std.Deviation	Std. Error Mean
2-1	L	43	3.93	.936	.143
	M	138	4.20	.921	.078
2-2*	L	43	3.74	1.002	.153
	M	138	3.30	1.098	.093
2-3*	L	43	2.79	1.206	.184
	M	138	2.18	1.027	.087
2-4*	L	43	3.00	1.195	.182
	M	138	2.41	1.023	.087
2-5*	L	43	3.02	1.336	.204
	M	138	2.46	1.147	.098
2-6*	L	43	3.79	.965	.147
	M	138	3.27	.986	.084
2-7	L	43	4.02	1.058	.161
	M	138	4.09	.908	.077
2-8	L	43	3.28	1.260	.192
	M	138	3.09	1.171	.100

\*: Statistically significant at a significant level of  $\alpha=0.05$

As seen in Table 4, two groups have statistical significant difference in several ones which are shaded in grey with a symbol of asterisk. Based on the statistical analyses, it is known that a group of logistics companies tends to have a higher perception about more close cooperation with customer externally.

**Table 5.** Statistical analyses for the degree of green actions internally

Group Statistics					
	Group	N	Mean	Std.Deviation	Std. Error Mean
3-1	L	43	4.44	1.402	.214
	M	138	4.48	1.352	.115
3-2*	L	43	3.72	1.161	.177
	M	138	3.12	1.264	.108
3-3*	L	43	4.12	1.028	.157
	M	138	3.63	1.134	.097
3-4	L	43	3.23	1.411	.215
	M	138	3.07	1.236	.105
3-5*	L	43	3.23	1.509	.230
	M	138	2.57	1.226	.104
3-6*	L	43	3.42	1.435	.219
	M	138	2.72	1.213	.103

\*: Statistically significant at a significant level of  $\alpha=0.05$

Based on the statistical analyses in Table 5, a group of logistics companies has a higher level of internal commitment guideline and program for green actions compared with a group of manufacturing companies.

**Table 6.** Statistical analyses for the degree of company’s management supports

Group Statistics					
	Group	N	Mean	Std.Deviation	Std. Error Mean
4-1	L	43	3.70	1.337	.204
	M	138	3.38	1.148	.098
4-2	L	43	3.86	1.082	.165
	M	138	3.50	1.179	.100
4-3	L	43	3.88	1.276	.195
	M	138	3.72	1.340	.114
4-4	L	43	3.79	1.186	.181
	M	138	3.61	1.270	.108

However, although a group of logistics companies tends to show a slightly higher perception, there is no statistically significant difference in the perception of company’s management about the environmentally friendly supply chain between two groups as seen in Table 6.

**Table 7.** Statistical analyses for the degree of company's benefits

Group Statistics					
Group	N	Mean	Std.Deviation	Std. Error Mean	
5-1*	L	43	3.33	1.286	.196
	M	138	2.78	1.290	.110
5-2	L	43	4.02	.963	.147
	M	138	3.83	1.208	.103
5-3	L	43	4.16	.785	.120
	M	138	3.86	1.135	.097
5-4	L	43	3.98	1.058	.161
	M	138	3.84	1.210	.103
5-5	L	43	3.88	1.074	.164
	M	138	3.90	1.109	.094
5-6	L	43	3.93	1.142	.174
	M	138	3.85	1.107	.094
5-7	L	43	3.79	1.059	.162
	M	138	3.67	1.096	.093
5-8	L	43	3.37	1.363	.208
	M	138	3.39	1.298	.111
5-9	L	43	3.51	1.183	.180
	M	138	3.46	1.221	.104
5-10	L	43	3.47	1.241	.189
	M	138	3.28	1.195	.102
5-11	L	43	3.60	1.237	.189
	M	138	3.82	1.303	.111
5-12	L	43	3.44	1.259	.192
	M	138	3.48	1.314	.112
5-13	L	43	3.93	1.261	.192
	M	138	4.02	1.229	.105
5-14	L	43	3.72	1.076	.164
	M	138	3.63	1.127	.096
5-15	L	43	3.88	1.005	.153
	M	138	3.84	.998	.085
5-16	L	43	3.91	.947	.144
	M	138	3.89	1.030	.088

\*: Statistically significant at a significant level of  $\alpha=0.05$

In addition, the business benefit could be assessed by practicing environmentally friendly supply chain practices such that a group of Logistics Companies got a higher benefit by reducing the cost of purchased materials after deploying the environmentally friendly supply chain practices.



**Table 8.** Statistical analyses for the detailed actions or practices for green supply chain

Group Statistics					
Group	N	Mean	Std.Deviation	Std. Error Mean	
9-1	L	43	3.98	1.244	.190
	M	138	3.84	1.167	.099
9-2*	L	43	3.81	1.258	.192
	M	138	3.17	1.329	.113
9-3*	L	43	3.51	1.437	.219
	M	138	2.95	1.325	.113
9-4*	L	43	3.40	1.530	.233
	M	138	2.70	1.432	.122
9-5*	L	43	3.19	1.500	.229
	M	138	2.54	1.399	.119
9-6	L	43	4.00	1.175	.179
	M	138	3.95	1.148	.098

\*: Statistically significant at a significant level of  $\alpha=0.05$

Finally, from the Table 8, it could be known that a group of Logistics Companies has tried to deploy the eco-friendly actions or practices for green supply chain such as the use of recycled, remanufactured materials or parts, process redesign of reverse logistics, and product/service redesign.

### 3. Conclusion

In Turkey, GSCM practices are starting out with a long way to travel and there are still rooms for application of logistics activities in a green way. In spite of having ISO 14000, the customers are not aware of the benefits of this certification properly. The important contributions of this research are to examine how external and internal drivers promote GSCM practices based on institutional theory and determine to find the major driver of GSCM practices. In this regard, a self-administrated questionnaire was developed. This questionnaire tried to measure firm's commitment to operate as an environmentally friendly firm. In the first part, companies had to report about a number of their basic facts. In the second part, companies reported about the measures that have been taken for implementing green supply chain practices, what kind of effect they have on firm's performance, level of dependence and trust between firm and important customers, whether firm has made any special investments for implementing green supply chain management (GSCM) practices and have started innovative measures with its important customers. The questionnaire forms were added to Appendix. A. We collect data from 2014 May to 2015 July through the Turkish companies. More than 180 companies have contributed in this extensive research. IBM SPSS Statistics 20 for Windows was employed in order to obtain the results. In addition to descriptive statistics, t-test was used. In the following sections, we have analyzed the statistical significance in perceptions of asked questions for two distinctive groups (i.e., Logistics Company and manufacturing company). As you find, the independent t-tests were performed using

SPSS statistical package (Version 20). 95% confidence interval (i.e.,  $\alpha=0.05$ ) in the mean value of collected data for each equation about two distinctive groups (i.e., “L” for logistics company, “M” for manufacturing company) are considered.

Based on the statistical analyses, two groups, i.e., group of logistics companies and group of manufacturing companies, have a very strict different perception in GSCM practices in Turkey. Overall assessment could be summarized as follows: Firstly, a group of logistics companies has a higher perception on the dependency with their customers. Secondly, logistics companies have tried to implement key actions or practices in GSCM compared with manufacturing companies. Also, logistics companies think that they get economic benefits by reducing the purchasing cost which can be reached by GSCM practice. Our findings is in line with the study of [16] which found business firms need to advance their operational, economic performance and build a strong internal green practices in order to accomplish the environmental performance. A noticeable finding is that there must be a clear gap in perception of GSCM practices between two target groups, although it must be an inevitable component for both groups to have the common target or business philosophy for a successful implementation of GSCM framework. Thus, it is necessary to develop a common platform to make them work and cooperate with each other. For future studies one may be able to try to apply other statistical analyses.

## **References**

Aksoy, A., Küçükoğlu, İ., Ene, S. and Öztürk, N., 2014. Integrated emission and fuel consumption calculation model for green supply chain management, *Procedia - Social and Behavioral Sciences* 109, 1106 – 1109.

Al Khattab, S.A. and As'ad, H., 2015. The Impact of the green supply chain management on environmental-based marketing performance, *Journal of Service Science and Management*, 8(04), 588-597.

Ball, A. and Craig, R., 2010. Using neo-institutionalism to advance social and environmental accounting., *Critical Perspectives on Accounting*, 21(4), 283-293.

Buysse, K. and Verbeke, A., 2003. Proactive environmental strategies: A stakeholder management perspective. *Strategic Management*, 24, 453-470.

Dubey, R., Gunasekaran, A., Papadopoulos, T. and Childe, S.J., 2015. Green supply chain management enablers: Mixed methods research. *Sustainable Production and Consumption*, 4, 72-88.

Foerstl, K., Azadegan, A., Leppelt, T. and Hartmann, E., 2015. Drivers of supplier sustainability: Moving beyond compliance to commitment. *Journal of Supply Chain Management*, 51(1), 67-92.

Hoejmose, S., Brammer, S. and Millington, A., 2012. Green supply chain management: the role of trust and top management b2b and b2c markets, *Industrial Marketing Management*, 41, 609-620.

- Kenneth, W., Green, J., Zelbst, P.J., Bhadauria, V.S. and Meacham, J., 2012. Do environmental collaboration and monitoring enhance organizational performance? *Industrial Management & Data Systems*, 112, 186-205.
- Lai, K.H., Wong, C.W.Y., Cheng, T.C. E., 2006. Institutional isomorphism and the adoption of information technology for supply chain management. *Computers in Industry*, 57 (1), 93–98.
- Lin, C.Y. and Ho, Y.H., 2011, Determinants of green practice adoption for logistics companies in China, *Journal of Business Ethics*, 98(1), 67-83.
- Preuss, L., 2001. In dirty chains? Purchasing and greener manufacturing, *Journal of Business Ethics*, 34(3-4), 345-359.
- Rostami-Fard, M., Shekari, H. and Eslami, S., 2014. Identifying the drivers of green supply chain management in tile industry using delphi technique. *Journal of Educational and Management Studies*, 4 (4), 851-860.
- Sarkis, J., Zhu, Q. and Lai, K.H., 2011. An organizational theoretic review of green supply chain management literature, *International Journal of Production Economics*, 130 (1), 1-15.
- Soetanto, K., Burki, U. and Ozturkoglu, Y., 2014. Accomplishing environmental performance in third party logistics providers, in *Proceedings of 21st EurOMA Conference*, 20-25 June, Palermo, Italy.
- Zhu, Q. and Liu, Q., 2010. Eco-design planning in a Chinese telecommunication network company: Benchmarking its parent company. *Benchmarking: An International Journal*, 17 (3), 363–377.
- Zhu, Q., Sarkis, J. and Lai, K.-H., 2007. Green supply chain management: pressures, practices and performance within the Chinese automobile industry. *Journal of Cleaner Production*, 15, 1041-1052.

## Appendix. A Survey Questionnaire

### Green Supply Chain Management (GSCM) Practices' Effect on the Performance of Turkish Business Relationships

For each and every question, please use the given 5 level value scale. The scale ranges from 1 to 5 where **1** *represents* "Strongly disagree" and **5** *represents* "Strongly agree". You must answer by setting a ring around one of the values in the scale which you think that best reflects your evaluation for the question.

For example:

Strongly disagree

Strongly agree

We are an international exporting firm      1   2   3   4      5

#### Part One: Descriptive Questions

1. Our firm has been doing this business since the year: \_\_\_\_\_
2. The main business activity of our firm is: \_\_\_\_\_
3. The total annual revenue of our firm in the year 2013 was: \_\_\_\_\_ €/\$US/TRY
4. The total number of full time employees in our firm is: \_\_\_\_\_
5. Our firm mainly works with industrial customers pertaining to:

Automobile  Chemical, Rubber & Plastic  Power Generation  Steel  Food Products & Beverages  Computer & Electronics  Petroleum  Pharmaceutical  Any Other Industry\_\_\_\_\_

#### Part Two: Customer Side

6. The chosen customer is:      a Local Customer       or      an International customer
7. Our firm has been doing business with this customer for the last \_\_\_\_\_ Years.
8. The total sales volume for this customer in the year 2013 was \_\_\_\_\_ €/\$US/TRY.

#### Part Three: Company Side

- Does your company apply the following actions externally?      Strongly *Disagree*      Strongly *Agree*

1. certification. It is important that the customer has ISO 14000 certification. 1 2 3 4 5
2. There is a close cooperation with customer to achieve environmentally friendly goals. 1 2 3 4 5
3. There is a close cooperation with customer to use green packing. 1 2 3 4 5
4. There is a close cooperation with customer to use environmentally friendly handling procedures. 1 2 3 4 5
5. There is a close cooperation with customer to regularly evaluate environmentally friendly practices. 1 2 3 4 5
6. It is important that environmentally friendly practices are followed by us and our customer. 1 2 3 4 5
7. It is important that our customer has tendency to avoid or reduce usage of hazardous products. 1 2 3 4 5
8. It is important that our customer follows some kind of recyclable procedures. 1 2 3 4 5

• **Does your company apply the following actions internally?**

1. Our firm has ISO 14000 certification. 1 2 3 4 5
2. There is an environmental management system in our firm. 1 2 3 4 5
3. Our top managers support environmentally friendly practices. 1 2 3 4 5
4. There is a regular internal environmentally friendly practices evaluation. 1 2 3 4 5
5. There exists an internal environment compliance and audit program. 1 2 3 4 5
6. There is a close internal cross-functional cooperation

*Green Supply Chain Management Practices' Effect on the Performance ...*

1 2 3 4 5 to improve environmentally friendly practices.

**• Does your company's management have the following approach about environmentally friendly supply chain?**

1. Top managers support the efforts to develop environmentally  
1 2 3 4 5 friendly supply chain management.

2. Environmentally friendly supply chain is considered  
1 2 3 4 5 a vital part of corporate strategy by top managers.

3. Environmentally friendly responsible buying and purchasing  
1 2 3 4 5 is considered important by top managers.

4. Mid-level managers support the efforts to develop environmentally  
1 2 3 4 5 friendly supply chain management.

**• Has your company benefited in the following ways by practicing environmentally friendly supply chain practices?**

1. Environmentally friendly supply chain practices have  
1 2 3 4 5 decreased cost of purchasing material.

2. Environmentally friendly supply chain practices have  
1 2 3 4 5 decreased cost of energy consumption.

3. Environmentally friendly supply chain practices have  
1 2 3 4 5 decreased fee for waste treatment.

4. Environmentally friendly supply chain practices have  
1 2 3 4 5 decreased fee for wastes discharge/dumping.

5. Environmentally friendly supply chain practices have  
1 2 3 4 5 decreased fine for environmental violations/accidents.

6. *Environmentally* friendly supply chain practices have  
1 2 3 4 5 improved/increased the overall efficiency of our firm.

7. Environmentally friendly supply chain practices have  
1 2 3 4 5 improved/increased the delivery amounts of goods/services.

8. Environmentally friendly supply chain practices have  
1 2 3 4 5 improved/increased the delivery timetable.

9. Environmentally friendly supply chain practices have  
 1 2 3 4 5 improved/increased the quality of products or services.

10. Environmentally friendly supply chain practices have  
 1 2 3 4 5 improved/increased the capacity utilization

11. Environmentally friendly supply chain practices have  
 1 2 3 4 5 decreased the production waste.

12. Environmentally friendly supply chain practices have  
 1 2 3 4 5 decreased the level of inventory.

13. *Environmentally* friendly supply chain practices have helped  
 1 2 3 4 5 to improve the environmental image of the company.

14. Environmentally friendly supply chain practices have led to  
 1 2 3 4 5 reduction of waste water.

15. Environmentally friendly supply chain practices have led to  
 1 2 3 4 5 reduction of solid wastes.

16. Environmentally friendly supply chain practices have led to  
 an improvement in company's environmental condition. 1 2 3 4  
 5

• **Is this customer dependent on our company for business?**

1. This customer is dependent on us. 1 2  
 3 4 5

2. We are important to this customer. 1 2  
 3 4 5

3. We purchase a large proportion of this customer's  
 1 2 3 4 5 total production volume.

4. If we stopped doing business with this customer, this  
 1 2 3 4 5 customer would find it difficult to find adequate orders.

• **Is your company dependent on this customer?**

*Green Supply Chain Management Practices' Effect on the Performance ...*

1. This customer is crucial for our future performance.  
1 2 3 4 5

2. It would be difficult for us to replace this customer.  
1 2 3 4 5

3. We are dependent on this customer. 1 2  
3 4 5

4. We do not have a good substitute for this customer.  
1 2 3 4 5

• **Does your company have the following feelings about this customer?**

1. We know that this supplier is sincere with us. 1  
2 3 4 5

2. This supplier is genuinely concerned with our business  
success. 1 2 3 4 5

3. We believe in the information that this vendor provides us.  
1 2 3 4 5

4. We trust this supplier. 1 2 3  
4 5

• **Has your firm ever taken the following actions?**

1. Have taken measure to lower consumption of water,  
electricity, gas and petrol during the production or disposal processes.  
1 2 3 4 5

2. Have recycled, reused and remanufactured materials or  
parts. 1 2 3 4 5

3. Have used cleaner/renewable technology to make savings  
1 2 3 4 5 in the usage of energy, water and waste.

4. Have redesigned production and operational processes to  
1 2 3 4 5 improve environmental efficiency.



5. Have done redesigning and improving products or services

1 2 3 4 5

to meet new environmental criteria.

6. Have done redesigning and improving products or services to meet environmental

1 2 3 4 5

standards on directives from the environmental authorities.

**Appendix. B Independent Samples Test for each questionnaire**

**Appendix.B1**

**Independent Samples Test**

		Levene's Test for		t-test for Equality of Means						
		Equality of Variances		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
		F	Sig.						Lower	Upper
2-1	Equal variances assumed	.259	.611	-1.688	179	.093	-.273	.162	-.591	.046
	Equal variances not assumed			-1.674	69.263	.099	-.273	.163	-.598	.052
2-2	Equal variances assumed	1.798	.182	2.340	179	.020	.440	.188	.069	.811
	Equal variances not assumed			2.455	76.041	.016	.440	.179	.083	.797
2-3	Equal variances assumed	1.924	.167	3.257	179	.001	.610	.187	.240	.979
	Equal variances not assumed			2.993	62.138	.004	.610	.204	.202	1.017
2-4	Equal variances assumed	.161	.689	3.193	179	.002	.594	.186	.227	.961
	Equal variances not assumed			2.942	62.352	.005	.594	.202	.190	.998
2-5	Equal variances assumed	.903	.343	2.682	179	.008	.559	.209	.148	.971
	Equal variances not assumed			2.476	62.503	.016	.559	.226	.108	1.011
2-6	Equal variances assumed	.237	.627	3.051	179	.003	.523	.171	.185	.861
	Equal variances not assumed			3.085	71.423	.003	.523	.169	.185	.860
2-7	Equal variances assumed	1.182	.279	-.386	179	.700	-.064	.165	-.389	.262
	Equal variances not assumed			-.356	62.499	.723	-.064	.179	-.421	.294
2-8	Equal variances assumed	.985	.322	.888	179	.376	.185	.208	-.226	.596
	Equal variances not assumed			.854	66.179	.396	.185	.216	-.247	.617

**Appendix.B2**

**Independent Samples Test**

		Levene's Test for		t-test for Equality of Means						
		Equality of Variances								
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper	
3-1	Equal variances assumed	.092	.762	-.153	179	.879	-.036	.238	-.506	.434
	Equal variances not assumed			-.150	68.099	.881	-.036	.243	-.521	.448
3-2	Equal variances assumed	.237	.627	2.758	179	.006	.598	.217	.170	1.025
	Equal variances not assumed			2.884	75.572	.005	.598	.207	.185	1.011
3-3	Equal variances assumed	1.295	.257	2.506	179	.013	.486	.194	.103	.868
	Equal variances not assumed			2.638	76.484	.010	.486	.184	.119	.853
3-4	Equal variances assumed	1.973	.162	.717	179	.475	.160	.223	-.281	.601
	Equal variances not assumed			.668	63.358	.506	.160	.240	-.319	.639
3-5	Equal variances assumed	5.487	.020	2.944	179	.004	.667	.227	.220	1.115
	Equal variances not assumed			2.641	60.264	.011	.667	.253	.162	1.173
3-6	Equal variances assumed	3.623	.059	3.133	179	.002	.694	.222	.257	1.131
	Equal variances not assumed			2.868	61.845	.006	.694	.242	.210	1.178

**Appendix.B3**

**Independent Samples Test**

		Levene's Test for		t-test for Equality of Means						
		Equality of Variances								
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper	
4-1	Equal variances assumed	1.607	.206	1.538	179	.126	.321	.209	-.091	.733
	Equal variances not assumed			1.419	62.487	.161	.321	.226	-.131	.773
4-2	Equal variances assumed	2.278	.133	1.784	179	.076	.360	.202	-.038	.759
	Equal variances not assumed			1.866	75.669	.066	.360	.193	-.024	.745
4-3	Equal variances assumed	.493	.483	.719	179	.473	.166	.231	-.290	.623
	Equal variances not assumed			.737	73.157	.463	.166	.226	-.283	.616
4-4	Equal variances assumed	1.828	.178	.833	179	.406	.182	.218	-.249	.613
	Equal variances not assumed			.864	74.423	.391	.182	.211	-.238	.602

Appendix.B4

Independent Samples Test

		Levene's Test for		t-test for Equality of Means						
		Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper	
5-1	Equal variances assumed	.047	.829	2.444	179	.016	.550	.225	.106	.995
	Equal variances not assumed			2.448	70.360	.017	.550	.225	.102	.998
5-2	Equal variances assumed	3.176	.076	.977	179	.330	.197	.202	-.201	.595
	Equal variances not assumed			1.100	86.827	.275	.197	.179	-.159	.554
5-3	Equal variances assumed	4.996	.027	1.619	179	.107	.300	.186	-.066	.667
	Equal variances not assumed			1.954	101.367	.053	.300	.154	-.005	.606
5-4	Equal variances assumed	.220	.639	.663	179	.508	.136	.205	-.269	.541
	Equal variances not assumed			.712	79.192	.479	.136	.191	-.245	.517
5-5	Equal variances assumed	.687	.408	-.077	179	.939	-.015	.192	-.394	.365
	Equal variances not assumed			-.078	72.137	.938	-.015	.189	-.392	.362
5-6	Equal variances assumed	.146	.703	.423	179	.673	.082	.195	-.302	.467
	Equal variances not assumed			.416	68.376	.679	.082	.198	-.313	.478
5-7	Equal variances assumed	.104	.748	.653	179	.515	.124	.190	-.251	.499
	Equal variances not assumed			.665	72.256	.508	.124	.187	-.248	.496
5-8	Equal variances assumed	.213	.645	-.084	179	.933	-.019	.229	-.472	.434
	Equal variances not assumed			-.082	67.439	.935	-.019	.235	-.489	.451
5-9	Equal variances assumed	.292	.590	.226	179	.821	.048	.212	-.370	.466
	Equal variances not assumed			.230	72.105	.819	.048	.208	-.367	.463
5-10	Equal variances assumed	.109	.741	.901	179	.369	.190	.211	-.226	.605
	Equal variances not assumed			.883	68.014	.380	.190	.215	-.239	.619
5-11	Equal variances assumed	.869	.352	-.952	179	.342	-.214	.225	-.658	.230
	Equal variances not assumed			-.979	73.349	.331	-.214	.219	-.650	.222
5-12	Equal variances assumed	.406	.525	-.160	179	.873	-.036	.227	-.485	.412
	Equal variances not assumed			-.164	72.749	.870	-.036	.222	-.479	.407
5-13	Equal variances assumed	.135	.713	-.424	179	.672	-.092	.216	-.518	.335
	Equal variances not assumed			-.418	68.695	.677	-.092	.219	-.528	.345
5-14	Equal variances assumed	.049	.825	.464	179	.643	.090	.195	-.294	.475
	Equal variances not assumed			.476	73.017	.636	.090	.190	-.288	.469
5-15	Equal variances assumed	.616	.434	.247	179	.805	.043	.175	-.301	.388
	Equal variances not assumed			.246	69.767	.806	.043	.175	-.306	.393
5-16	Equal variances assumed	.286	.593	.089	179	.929	.016	.177	-.333	.364
	Equal variances not assumed			.093	75.565	.926	.016	.169	-.321	.352

Appendix.B5

Independent Samples Test

		1. Levene's Test for		3. t-test for Equality of Means						
		Equality of Variances								
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
6-1	Equal variances assumed	3.177	.076	1.860	179	.065	.437	.235	-.027	.900
	Equal variances not assumed			2.043	82.795	.044	.437	.214	.012	.862
6-2	Equal variances assumed	.009	.924	-1.960	179	.052	-.378	.193	-.760	.003
	Equal variances not assumed			-1.896	66.692	.062	-.378	.200	-.777	.020
6-3	Equal variances assumed	.972	.326	1.205	179	.230	.254	.211	-.162	.670
	Equal variances not assumed			1.269	76.571	.208	.254	.200	-.145	.652
6-4	Equal variances assumed	.048	.826	1.521	179	.130	.364	.239	-.108	.835
	Equal variances not assumed			1.549	72.198	.126	.364	.235	-.104	.832

Appendix.B6

Independent Samples Test

		Levene's Test for		t-test for Equality of Means						
		Equality of Variances								
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
7-1	Equal variances assumed	3.341	.069	.404	179	.687	.077	.189	-.297	.450
	Equal variances not assumed			.372	62.245	.711	.077	.206	-.335	.488
7-2	Equal variances assumed	1.047	.308	1.223	179	.223	.249	.204	-.153	.652
	Equal variances not assumed			1.128	62.427	.264	.249	.221	-.193	.692
7-3	Equal variances assumed	.024	.878	1.682	179	.094	.331	.197	-.057	.719
	Equal variances not assumed			1.696	71.034	.094	.331	.195	-.058	.720
7-4	Equal variances assumed	.092	.762	2.833	179	.005	.564	.199	.171	.957
	Equal variances not assumed			2.964	75.643	.004	.564	.190	.185	.943

Appendix.B7

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
8-1	Equal variances assumed	12.388	.001	2.286	179	.023	.476	.208	.065	.886
	Equal variances not assumed			2.623	90.535	.010	.476	.181	.115	.836
8-2	Equal variances assumed	1.330	.250	-.330	179	.742	-.047	.142	-.328	.234
	Equal variances not assumed			-.312	64.630	.756	-.047	.150	-.348	.254
8-3	Equal variances assumed	.175	.676	-.215	179	.830	-.035	.161	-.353	.283
	Equal variances not assumed			-.217	71.048	.829	-.035	.160	-.354	.284
8-4	Equal variances assumed	8.266	.005	-.962	179	.337	-.181	.189	-.554	.191
	Equal variances not assumed			-.862	60.193	.392	-.181	.210	-.603	.240

Appendix.B8

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
9-1	Equal variances assumed	.018	.895	.658	179	.512	.136	.207	-.272	.545
	Equal variances not assumed			.636	66.652	.527	.136	.214	-.291	.564
9-2	Equal variances assumed	.240	.625	2.792	179	.006	.640	.229	.188	1.092
	Equal variances not assumed			2.873	73.522	.005	.640	.223	.196	1.084
9-3	Equal variances assumed	1.257	.264	2.381	179	.018	.562	.236	.096	1.028
	Equal variances not assumed			2.281	65.793	.026	.562	.246	.070	1.055
9-4	Equal variances assumed	.397	.530	2.724	179	.007	.692	.254	.191	1.194
	Equal variances not assumed			2.631	66.537	.011	.692	.263	.167	1.218
9-5	Equal variances assumed	.374	.542	2.613	179	.010	.650	.249	.159	1.140
	Equal variances not assumed			2.519	66.373	.014	.650	.258	.135	1.165
9-6	Equal variances assumed	1.158	.283	.252	179	.802	.051	.202	-.347	.449
	Equal variances not assumed			.248	68.841	.804	.051	.204	-.357	.458