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Ordering of components of Green Supply Chain Practices jointly impacting the individual components of Green Supply Chain Performance – An Empirical Study of the Indian Automobile Manufacturing Sector

Mohd. Asif Gandhi
National Institute of Industrial Engineering (NITIE),
Department of Operations Management, Mumbai, India;

Sanjay Sharma
National Institute of Industrial Engineering (NITIE),
Department of Operations Management, Mumbai, India

ABSTRACT
This paper establishes the order in which five identified green supply chain practices jointly impact ten identified individual component measures of green supply chain performance with reference to the automobile manufacturing sector of India. This research paper is an extension of the research work done by [1]. The purpose of this research paper is to test the hypotheses developed by [1]. Further the joint impact of Green Supply Chain Practices on individual components of Green Supply Chain Performance has been established by means of ten multiple regression models. Consistently the ten multiple regression models that were developed established that there is a definite ordering of the five Green Supply Chain Practices while jointly impacting each of the ten component measures of Green Supply Chain Performance individually. These findings would enable practicing managers in the automobile manufacturing sector of India to take decisions related to implementation of green supply chain practices which would result in enhancing a particular green supply chain performance measure. This information regarding implementation of Green Supply Chain Practices would be very handy as it has financial and policy making implications.

Keywords: Automobile Manufacturing; Empirical Study; Components of Green Supply Chain Practices; Components of Green Supply Chain Performance; Indian.

INTRODUCTION

The research problem here is to test sixty-one hypotheses out of which fifty have been developed by [1] related to the association of Green Supply Chain Practices with individual component measures of Green Supply Chain Performance with reference to the automobile manufacturing sector of India. Additionally another eleven hypotheses have been framed in this paper pertaining to the ordering and joint impact of Green Supply Chain Practices on individual component measures of Green Supply Chain Performance.

Literature that studies the impact of Green Supply Chain Practices on Green Supply Chain Performance measures is on the rise. Few of the studies that have addressed this linkage are as follows: [1]; [2]; [3]; [4]; [5]; [6]; [7].

It has been established by the existing literature that Green Supply Chain Practices have an impact on measures of GSC performance [8] only at a broad level. Not many studies have focused identifying the exact joint impact of Green Supply Chain Practices on particular component measures of Green Supply Chain Performance [4], [5], [6], [7]. Further the existing studies could not state conclusively the ordering of the GSC Practices that jointly impact a particular component measure of GSC Performance.

The purpose of this study is to test the association between the components of green supply chain practices and the components of green supply chain performance with reference to the automobile manufacturing sector in India. The study also tests already developed hypotheses pertaining to the association of GSC Practices with component measures of Green Supply Chain Performance [1]. The study additionally identifies the joint impact of Green Supply Chain Practices on individual component measures of Green Supply Chain Performance [1]. Finally the study identifies the order of influence of the GSC Practices while jointly impacting the individual component measures of GSC Performance.

THE CONCEPTUAL FRAMEWORK IDENTIFIED FOR TESTING THE HYPOTHESES

The conceptual framework showing the joint influence of green supply chain practices on component green supply chain performance measures as appearing in existing literature [1] is shown in figure 1. One of the Green Supply Chain Performance measures namely Green Supply Chain Execution, as identified in the mentioned paper consists further of five components namely Green Supply Chain Execution-Production; Green Supply Chain Execution-Logistics; Green Supply Chain Execution-Packaging; Green Supply Chain Execution-Marketing; Green Supply Chain Execution-Supply Loops [9].

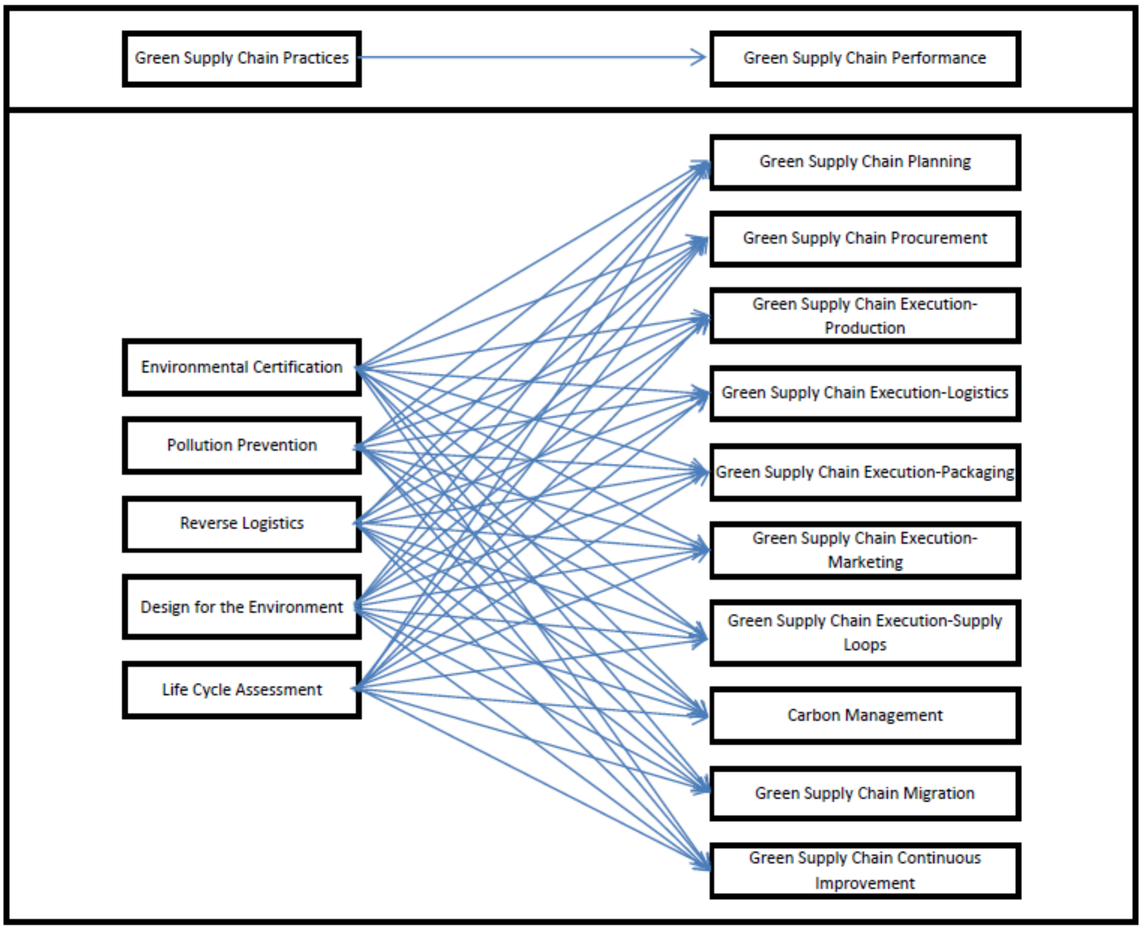

Figure 1. Association between components of Green Supply Chain Practices and components of Green Supply Chain Performance

METHODS

This research may be described as quantitative research. It makes use of deductive reasoning for drawing conclusions. The data was collected by making use of a newly and originally prepared questionnaire instrument to scale the constructs namely Green Supply Chain Practices; and Green Supply Chain Performance as well as their sub-constructs by using a 5-pont balanced Likert scale. The population consisted of plants of all Indian automobile manufacturing firms. The sample consisted of respondents from automobile manufacturing firms and their plants from India. The participants consist of representative executives from various automobile manufacturing firms having knowledge of the subject area of the research i.e. Green Supply Chain Practices and Green Supply Chain Performance.

A close-ended questionnaire instrument developed by [1] was used to scale the collected data. The questionnaire was administered on the respondents to scale the five green supply chain practices and the ten component measures of green supply chain performance. The questionnaire items are shown in the appendix section of this document.

A covering letter supported the instrument and the instrument contained demographic items, attitudinal items, behavioral items, factual items and closing instructions. The instrument used a continuous scale to measure the items; the instrument was subjected to expert comments of eminent faculties/practitioners in the field of green supply chain management. The suggestions given by them were subsequently incorporated to further improvise or revise the questionnaire. The pilot survey was of sample size 50 and the major survey was of sample size 103 including the 50 samples of the pilot survey.

The construct Green Supply Chain Practices has five sub-constructs and the construct Green Supply Chain Performance has ten sub-constructs as shown in the Table 1.

Table 1. Summary of the constructs and sub-constructs used in the study in their abbreviated and expanded forms

Sr. No.	Constructs and their sub-constructs in their abbreviated form	Constructs and their sub-constructs in their expanded form
	GSC Practices	Green Supply Chain Practices
1	EC	Environmental Certification
2	PP	Pollution Prevention
3	RL	Reverse Logistics
4	LCA	Life Cycle Assessment
5	DfE	Design for the Environment
	GSC Performance	Green Supply Chain Performance
6	GSCPLAN	Green Supply Chain Planning
7	GSCPROC	Green Supply Chain Procurement
8	GSCEXPROD	Green Supply Chain Execution-Production
9	GSCEXLOG	Green Supply Chain Execution-Logistics
10	GSCEXPACK	Green Supply Chain Execution-Packaging
11	GSCEXMARK	Green Supply Chain Execution-Marketing
12	GSCEXSL	Green Supply Chain Execution-Supply Loops
13	CM	Carbon Management
14	GSCMIG	Green Supply Chain Migration
15	GSCCI	Green Supply Chain Continuous Improvement

The data that was collected on administering the questionnaire on the respondents was entered in an EXCEL sheet manually by coding the responses on a 5-point balanced Likert scale as 1, 2 3 4 and 5. The data was subsequently transferred to statistical analysis software SASS for the analysis. The descriptive statistics of the data collected is shown in the Table 2.

Table 2. Descriptive statistics of the sub-constructs used in the pilot study

Sub-constructs	N	Mean	Std. Dev.	Sum	Minimum	Maximum
GSCPLAN	50	4.12000	0.83690	206.00000	2.00000	5.00000
GSCPROC	50	4.15818	0.85750	207.90909	1.72727	5.00000
GSCEXPROD	50	4.39429	0.60165	219.71429	2.57143	5.00000
GSCEXLOG	50	4.19833	0.44221	209.91667	3.16667	4.75000
GSCEXPACK	50	4.37000	1.09991	218.50000	2.00000	5.00000
GSCEXMARK	50	3.77000	1.07124	188.50000	1.25000	5.00000
GSCEXSL	50	3.48000	0.69059	174.00000	2.00000	4.66667
CM	50	3.60571	0.80272	180.28571	1.00000	5.00000
GSCMIG	50	4.02400	1.14331	201.20000	1.00000	5.00000
GSCCI	50	4.26000	1.02441	213.00000	1.81818	5.00000
EC	50	4.47600	0.66626	223.80000	2.00000	5.00000
PP	50	4.46909	0.76488	223.45455	2.00000	5.00000
RL	50	3.48000	0.83885	174.00000	1.20000	4.60000
LCA	50	4.07333	0.94830	203.66667	1.00000	5.00000
DFE	50	4.15750	0.73097	207.87500	1.00000	5.00000

In order to evaluate the reliability of the data collected, Cronbach Coefficient Alpha was evaluated for each of the sub-constructs in the study. Table 3 shows the various sub-constructs involved in the study along with the corresponding value of the Cronbach Coefficient Alpha. This coefficient is a measure of reliability. Normally values starting from around 0.7 and going upwards are considered to indicate a good reliability. By reviewing the Cronbach Coefficient Alpha for the sub-constructs shown in the table 3, it is observed that the questionnaire is reliable to scale all the fifteen items. Sample size was 50 respondents for this pilot study whereas for getting a true indication of reliability, a sample size of around 100 respondents is needed. Accordingly, 103 samples were taken for this study during the major survey so that better conclusion could be drawn.

Table 3. Cronbach Alpha values as a measure of reliability for the various sub-constructs used in the study

Sr. No.	Sub-constructs	Cronbach Coefficient Alpha for the sub-constructs	
		Raw	Standardized
1	Environmental Certification	0.839954	0.850132
2	Pollution Prevention	0.977275	0.981131
3	Reverse Logistics	0.920683	0.922742
4	Life Cycle Assessment	0.614101	0.649368
5	Design for the Environment	0.886993	0.898978
6	Green Supply Chain Planning	0.947669	0.953422
7	Green Supply Chain Procurement	0.960878	0.954046
8	Green Supply Chain Execution (Green Production)	0.845737	0.888054
9	Green Supply Chain Execution (Green Logistics)	0.775143	0.817626
10	Green Supply Chain Execution (Green Packaging)	0.997976	0.997972
11	Green Supply Chain Execution (Green Marketing)	0.969056	0.968858
12	Green Supply Chain Execution (Supply Loops)	0.279859	0.252359
13	Carbon Management	0.836164	0.831687
14	Green Supply Chain Migration	0.978998	0.979889
15	Green Supply Chain Continuous Improvement	0.989219	0.989432

The Cronbach Coefficient Alpha for Green Supply Chain Execution (Supply Loops) is less but it has got strong support of existing literature in its favour; so it has been retained [9].

FACTOR ANALYSIS OF THE DATA COLLECTED DURING THE PILOT STUDY

Confirmatory Factor Analysis was conducted on the variables constituting the sub- constructs DFE [10], EC [11], LCA [12], PP [13] and RL [14]. Confirmatory Factor Analysis was also conducted on the variables constituting the sub-constructs GSCPLAN [15], GSCPROC [16], GSCEXPROD [17], GSCEXLOG [18], GSCEXPACK [19], GSCEXMARK [20], GSCEXSL [21], CM [22], GSCMIG [23] and GSCCI [24] in a similar manner. This helped in identifying the factors and also in establishing the communality estimates for or each of the sub-constructs in the questionnaire. By sorting the component variables of each sub-construct in descending order of value of their communality estimates, it was possible to establish the order of contribution of component variables constituting each sub-construct [10], [11], [12], [13], [14], [15], [16], [17], [18], [19], [20], [21], [22], [23] and [24]. The major survey consisted of 103 samples including the 50 samples taken during the pilot survey. The ten sub-constructs of the construct GSC Performance (Green Supply Chain Performance) and the five sub-constructs of the construct GSC Practices (Green Supply Chain Practices) used in correlation analysis are shown in Table 4 in their abbreviated form.

Table 4. The set of constructs used in correlation analysis

10 Constructs	GSCPLAN	GSCPROC	GSCEXPROD	GSCEXLOG	GSCEXPACK	GSCEXMARK	GSCEXSL	CM	GSCMIG	GSCCI
5 Constructs	EC	PP	RL	LCA	DFE					

The descriptive statistics of the data collected and scaled during the major survey is shown in the Table 5.

Table 5. Descriptive statistics of the data scaled during the major survey

Simple Descriptive Statistics						
Variable	N	Mean	Std Dev	Sum	Minimum	Maximum
GSCPLAN	103	4.40194	0.77788	453.40000	2.00000	5.00000
GSCPROC	103	4.42807	0.77950	456.09091	1.72727	5.00000
GSCEXPROD	103	4.58669	0.55035	472.42857	2.57143	5.00000
GSCEXLOG	103	4.37136	0.43627	450.25000	3.16667	4.75000
GSCEXPACK	103	4.78155	0.41076	492.50000	4.00000	5.00000
GSCEXMARK	103	4.15534	1.03441	428.00000	1.25000	5.00000
GSCEXSL	103	4.36893	0.33305	450.00000	4.00000	4.66667
CM	103	3.81692	0.70112	393.14286	1.00000	5.00000
GSCMIG	103	4.60388	0.44368	474.20000	4.00000	5.00000
GSCCI	103	4.69462	0.38461	483.54545	4.00000	5.00000

Table 6 shows the Pearson's correlation coefficient between each of the five components of green supply chain practices and each of the ten components of green supply chain performance. Accordingly, in all fifty associations were identified for a co-relational study.

Table 6. Correlations between the sub-constructs of GSC Practices and GSC Performance

Pearson Correlation Coefficients, N=103 Prob > |r| under H0: Rho=0					
Sub-constructs	EC	PP	RL	LCA	DFE
GSCPLAN	0.77652 <.0001	0.89556 <.0001	0.58815 <.0001	0.86637 <.0001	0.89235 <.0001
GSCPROC	0.79505 <.0001	0.91784 <.0001	0.64056 <.0001	0.89016 <.0001	0.88818 <.0001
GSCEXPROD	0.81458 <.0001	0.94278 <.0001	0.59098 <.0001	0.90133 <.0001	0.77809 <.0001
GSCEXLOG	0.73401 <.0001	0.78128 <.0001	0.33109 0.0006	0.78431 <.0001	0.88357 <.0001
GSCEXPACK	0.75984 <.0001	0.89303 <.0001	0.73419 <.0001	0.91591 <.0001	0.59887 <.0001
GSCEXMARK	0.43783 <.0001	0.57391 <.0001	0.35796 0.0002	0.72417 <.0001	0.92030 <.0001
GSCEXSL	0.56192 <.0001	0.63907 <.0001	0.29853 0.0022	0.74510 <.0001	0.89379 <.0001
CM	0.42258 <.0001	0.59716 <.0001	0.50793 <.0001	0.76088 <.0001	0.86238 <.0001
GSCMIG	0.63345 <.0001	0.72321 <.0001	0.39958 <.0001	0.81444 <.0001	0.89433 <.0001
GSCCI	0.75947 <.0001	0.87719 <.0001	0.62598 <.0001	0.93066 <.0001	0.79845 <.0001

On the basis of Table 6 it is possible to test the association between the fifty pairs of sub-constructs and hence test the fifty hypotheses which have been framed [1]. Also additionally eleven hypotheses pertaining to the ordering and the joint influence of components of GSC Practices on individual component measures of GSC Performance have been framed. Table 7 shows all the sixty-one hypotheses to be tested in their null and alternate form. Also it shows the decision of accepting or rejecting the hypotheses on the basis of correlation coefficient and/or regression analysis. For values of p less than 0.05 the null hypotheses have been rejected else they have been accepted.

Table 7. Hypotheses tested along with the decision of accepting or rejecting them based on correlation analysis and/or regression analysis

Sr. No.	Null Hypothesis / Alternate Hypothesis	Hypothesis	Pearson's correlation coefficient	p value for Significance level (α = 0.05)	Decision about the hypothesis
1	$H1_0$	Environmental Certification has no association with GSC Planning.	0.77652	<.0001	Reject Null Hypothesis
	$H1_a$	Environmental Certification has a significant positive association with GSC Planning.			Accept Alternate Hypothesis
2	$H2_0$	Environmental Certification has no association with Green Procurement.	0.79505	<.0001	Reject Null Hypothesis
	$H2_a$	Environmental Certification has a significant positive association with Green Procurement.			Accept Alternate Hypothesis
3	$H3a_0$	Environmental Certification has no association with Green Production component of GSC Execution.	0.81458	<.0001	Reject Null Hypothesis
	$H3a_a$	Environmental Certification has a significant positive association with Green Production component of GSC Execution.			Accept Alternate Hypothesis
4	$H3b_0$	Environmental Certification has no association with Green Logistics component of GSC Execution.	0.73401	<.0001	Reject Null Hypothesis
	$H3b_a$	Environmental Certification has a significant positive association with Green Logistics component of GSC Execution.			Accept Alternate Hypothesis
5	$H3c_0$	Environmental Certification has no association with Green Packaging component of GSC Execution.	0.75984	<.0001	Reject Null Hypothesis
	$H3c_a$	Environmental Certification has a significant positive association with Green Packaging component of GSC Execution.			Accept Alternate Hypothesis
6	$H3d_0$	Environmental Certification has no association with Green Marketing component of GSC Execution.	0.43783	<.0001	Reject Null Hypothesis

Sr. No.	Null Hypothesis / Alternate Hypothesis	Hypothesis	Pearson's correlation coefficient	p value for Significance level (α = 0.05)	Decision about the hypothesis
	$H3d_a$	Environmental Certification has a significant positive association with Green Marketing component of GSC Execution.			Accept Alternate Hypothesis
7	$H3e_0$	Environmental Certification has no association with Supply Loops component of GSC Execution.	0.56192	<.0001	Reject Null Hypothesis
	$H3e_a$	Environmental Certification has a significant positive association with Supply Loops component of GSC Execution.			Accept Alternate Hypothesis
8	$H4_0$	Environmental Certification has no association with Carbon Management.	0.42258	<.0001	Reject Null Hypothesis
	$H4_a$	Environmental Certification has a significant positive association with Carbon Management.			Accept Alternate Hypothesis
9	$H5_0$	Environmental Certification has no association with GSC Migration.	0.63345	<.0001	Reject Null Hypothesis
	$H5_a$	Environmental Certification has a significant positive association with GSC Migration.			Accept Alternate Hypothesis
10	$H6_0$	Environmental Certification has no association with GSC Continuous Improvement.	0.75947	<.0001	Reject Null Hypothesis
	$H6_a$	Environmental Certification has a significant positive association with GSC Continuous Improvement.			Accept Alternate Hypothesis
11	$H7_0$	Pollution prevention has no association with GSC Planning.	0.89556	<.0001	Reject Null Hypothesis
	$H7_a$	Pollution prevention has a significant positive association with GSC Planning.			Accept Alternate Hypothesis
12	$H8_0$	Pollution prevention has no association with Green Procurement.	0.91784	<.0001	Reject Null Hypothesis
	$H8_a$	Pollution prevention has a significant positive association with Green Procurement.			Accept Alternate Hypothesis
13	$H9a_0$	Pollution prevention has no association with Green Production component of GSC Execution.	0.94278	<.0001	Reject Null Hypothesis
	$H9a_a$	Pollution prevention has a significant positive association with Green Production component of GSC Execution.			Accept Alternate Hypothesis

Sr. No.	Null Hypothesis / Alternate Hypothesis	Hypothesis	Pearson's correlation coefficient	p value for Significance level (α = 0.05)	Decision about the hypothesis
14	$H9b_0$	Pollution prevention has no association with Green Logistics component of GSC Execution.	0.78128	<.0001	Reject Null Hypothesis
	$H9b_a$	Pollution prevention has a significant positive association with Green Logistics component of GSC Execution.			Accept Alternate Hypothesis
15	$H9c_0$	Pollution prevention has no association with Green Packaging component of GSC Execution.	0.89303	<.0001	Reject Null Hypothesis
	$H9c_a$	Pollution prevention has a significant positive association with Green Packaging component of GSC Execution.			Accept Alternate Hypothesis
16	$H9d_0$	Pollution prevention has no association with Green Marketing component of GSC Execution.	0.57391	<.0001	Reject Null Hypothesis
	$H9d_a$	Pollution prevention has a significant positive association with Green Marketing component of GSC Execution.			Accept Alternate Hypothesis
17	$H9e_0$	Pollution prevention has no association with Supply Loops component of GSC Execution.	0.63907	<.0001	Reject Null Hypothesis
	$H9e_a$	Pollution prevention has a significant positive association with Supply Loops component of GSC Execution.			Accept Alternate Hypothesis
18	$H10_0$	Pollution prevention has no association with Carbon Management.	0.59716	<.0001	Reject Null Hypothesis
	$H10_a$	Pollution prevention has a significant positive association with Carbon Management.			Accept Alternate Hypothesis
19	$H11_0$	Pollution prevention has no association with GSC Migration.	0.72321	<.0001	Reject Null Hypothesis
	$H11_a$	Pollution prevention has a significant positive association with GSC Migration.			Accept Alternate Hypothesis
20	$H12_0$	Pollution prevention has no association with GSC Continuous Improvement.	0.87719	<.0001	Reject Null Hypothesis
	$H12_a$	Pollution prevention has a significant positive association with GSC Continuous Improvement.			Accept Alternate Hypothesis
21	$H13_0$	Life Cycle Assessment has no association with GSC Planning.	0.86637	<.0001	Reject Null Hypothesis

Sr. No.	Null Hypothesis / Alternate Hypothesis	Hypothesis	Pearson's correlation coefficient	p value for Significance level (α = 0.05)	Decision about the hypothesis
	$H13_a$	Life Cycle Assessment has a significant positive association with GSC Planning.			Accept Alternate Hypothesis
22	$H14_0$	Life Cycle Assessment has no association with Green Procurement.	0.89016	<.0001	Reject Null Hypothesis
	$H14_a$	Life Cycle Assessment has a significant positive association with Green Procurement.			Accept Alternate Hypothesis
23	$H15a_0$	Life Cycle Assessment has no association with Green Production component of GSC Execution.	0.90133	<.0001	Reject Null Hypothesis
	$H15a_a$	Life Cycle Assessment has a significant positive association with Green Production component of GSC Execution.			Accept Alternate Hypothesis
24	$H15b_0$	Life Cycle Assessment has no association with Green Logistics component of GSC Execution.	0.78431	<.0001	Reject Null Hypothesis
	$H15b_a$	Life Cycle Assessment has a significant positive association with Green Logistics component of GSC Execution.			Accept Alternate Hypothesis
25	$H15c_0$	Life Cycle Assessment has no association with Green Packaging component of GSC Execution.	0.91591	<.0001	Reject Null Hypothesis
	$H15c_a$	Life Cycle Assessment has a significant positive association with Green Packaging component of GSC Execution.			Accept Alternate Hypothesis
26	$H15d_0$	Life Cycle Assessment has no association with Green Marketing component of GSC Execution.	0.72417	<.0001	Reject Null Hypothesis
	$H15d_a$	Life Cycle Assessment has a significant positive association with Green Marketing component of GSC Execution.			Accept Alternate Hypothesis
27	$H15e_0$	Life Cycle Assessment has no association with Supply Loops component of GSC Execution.	0.74510	<.0001	Reject Null Hypothesis
	$H15e_a$	Life Cycle Assessment has a significant positive association with Supply Loops component of GSC Execution.			Accept Alternate Hypothesis
28	$H16_0$	Life Cycle Assessment has no association with Carbon Management.	0.76088	<.0001	Reject Null Hypothesis

Sr. No.	Null Hypothesis / Alternate Hypothesis	Hypothesis	Pearson's correlation coefficient	p value for Significance level (α = 0.05)	Decision about the hypothesis
	$H16_a$	Life Cycle Assessment has a significant positive association with Carbon Management.			Accept Alternate Hypothesis
29	$H17_0$	Life Cycle Assessment has no association with GSC Migration.	0.81444	<.0001	Reject Null Hypothesis
	$H17_a$	Life Cycle Assessment has a significant positive association with GSC Migration.			Accept Alternate Hypothesis
30	$H18_0$	Life Cycle Assessment has no association with GSC Continuous Improvement.	0.93066	<.0001	Reject Null Hypothesis
	$H18_a$	Life Cycle Assessment has a significant positive association with GSC Continuous Improvement.			Accept Alternate Hypothesis
31	$H19_0$	Design for Environment has no association with GSC Planning.	0.89235	<.0001	Reject Null Hypothesis
	$H19_a$	Design for Environment has a significant positive association with GSC Planning.			Accept Alternate Hypothesis
32	$H20_0$	Design for Environment has no association with Green Procurement.	0.88818	<.0001	Reject Null Hypothesis
	$H20_a$	Design for Environment has a significant positive association with Green Procurement.			Accept Alternate Hypothesis
33	$H21a_0$	Design for Environment has no association with Green Production component of GSC Execution.	0.77809	<.0001	Reject Null Hypothesis
	$H21a_a$	Design for Environment has a significant positive association with Green Production component of GSC Execution.			Accept Alternate Hypothesis
34	$H21b_0$	Design for Environment has no association with Green Logistics component of GSC Execution.	0.88357	<.0001	Reject Null Hypothesis
	$H21b_a$	Design for Environment has a significant positive association with Green Logistics component of GSC Execution.			Accept Alternate Hypothesis
35	$H21c_0$	Design for Environment has no association with Green Packaging component of GSC Execution.	0.59887	<.0001	Reject Null Hypothesis

Sr. No.	Null Hypothesis / Alternate Hypothesis	Hypothesis	Pearson's correlation coefficient	p value for Significance level (α = 0.05)	Decision about the hypothesis
	$H21c_a$	Design for Environment has a significant positive association with Green Packaging component of GSC Execution.			Accept Alternate Hypothesis
36	$H21d_0$	Design for Environment has no association with Green Marketing component of GSC Execution.	0.92030	<.0001	Reject Null Hypothesis
	$H21d_a$	Design for Environment has a significant positive association with Green Marketing component of GSC Execution.			Accept Alternate Hypothesis
37	$H21e_0$	Design for Environment has no association with Supply Loops component of GSC Execution.	0.89379	<.0001	Reject Null Hypothesis
	$H21e_a$	Design for Environment has a significant positive association with Supply Loops component of GSC Execution.			Accept Alternate Hypothesis
38	$H22_0$	Design for Environment has no association with Carbon Management.	0.86238	<.0001	Reject Null Hypothesis
	$H22_a$	Design for Environment has a significant positive association with Carbon Management.			Accept Alternate Hypothesis
39	$H23_0$	Design for Environment has no association with GSC Migration.	0.89433	<.0001	Reject Null Hypothesis
	$H23_a$	Design for Environment has a significant positive association with GSC Migration.			Accept Alternate Hypothesis
40	$H24_0$	Design for Environment has a no association with GSC Continuous Improvement.	0.79845	<.0001	Reject Null Hypothesis
	$H24_a$	Design for Environment has a significant positive association with GSC Continuous Improvement.			Accept Alternate Hypothesis
41	$H25_0$	Reverse Logistics has a no association with GSC Planning.	0.58815	<.0001	Reject Null Hypothesis
	$H25_a$	Reverse Logistics has a significant positive association with GSC Planning.			Accept Alternate Hypothesis
42	$H26_0$	Reverse Logistics has no association with Green Procurement.	0.64056	<.0001	Reject Null Hypothesis
	$H26_a$	Reverse Logistics has a significant positive association with Green Procurement.			Accept Alternate Hypothesis

Sr. No.	Null Hypothesis / Alternate Hypothesis	Hypothesis	Pearson's correlation coefficient	p value for Significance level (α = 0.05)	Decision about the hypothesis
43	$H27a_0$	Reverse Logistics has no association with Green Production component of GSC Execution.	0.59098	<.0001	Reject Null Hypothesis
	$H27a_a$	Reverse Logistics has a significant positive association with Green Production component of GSC Execution.			Accept Alternate Hypothesis
44	$H27b_0$	Reverse Logistics has no association with Green Logistics component of GSC Execution.	0.33109	0.0006	Reject Null Hypothesis
	$H27b_a$	Reverse Logistics has a significant positive association with Green Logistics component of GSC Execution.			Accept Alternate Hypothesis
45	$H27c_0$	Reverse Logistics has no association with Green Packaging component of GSC Execution.	0.73419	<.0001	Reject Null Hypothesis
	$H27c_a$	Reverse Logistics has a significant positive association with Green Packaging component of GSC Execution.			Accept Alternate Hypothesis
46	$H27d_0$	Reverse Logistics has no association with Green Marketing component of GSC Execution.	0.35796	0.0002	Reject Null Hypothesis
	$H27d_a$	Reverse Logistics has a significant positive association with Green Marketing component of GSC Execution.			Accept Alternate Hypothesis
47	$H27e_0$	Reverse Logistics has no association with Supply Loops component of GSC Execution.	0.29853	<0.0022	Reject Null Hypothesis
	$H27e_a$	Reverse Logistics has a significant positive association with Supply Loops component of GSC Execution.			Accept Alternate Hypothesis
48	$H28_0$	Reverse Logistics has no association with Carbon Management.	0.50793	<.0001	Reject Null Hypothesis
	$H28_a$	Reverse Logistics has a significant positive association with Carbon Management.			Accept Alternate Hypothesis
49	$H29_0$	Reverse Logistics has no association with GSC Migration.	0.39958	<.0001	Reject Null Hypothesis
	$H29_a$	Reverse Logistics has a significant positive association with GSC Migration.			Accept Alternate Hypothesis

Sr. No.	Null Hypothesis / Alternate Hypothesis	Hypothesis	Pearson's correlation coefficient	p value for Significance level (α = 0.05)	Decision about the hypothesis
50	$H30_0$	Reverse Logistics has a no association with GSC Continuous Improvement	0.62598	<.0001	Reject Null Hypothesis
	$H30_a$	Reverse Logistics has a significant positive association with GSC Continuous Improvement.			Accept Alternate Hypothesis
51	$H31_0$	There is no definite order in which the five Green Supply Chain Practices namely Environmental Certification; Pollution Prevention; Life Cycle Assessment; Design for Environment; and Reverse Logistics impact the Green Supply Chain Planning component of Green Supply Chain Performance.	The null hypothesis is rejected and the alternate hypothesis is accepted on the basis of the evidence provided by Table 6, Table 8, Table 9, Table 10, Table 39, Table 41 and Figure 12.		Reject null hypothesis
	H31a	There is a definite order in which the five Green Supply Chain Practices namely Environmental Certification; Pollution Prevention; Life Cycle Assessment; Design for Environment; and Reverse Logistics impact the Green Supply Chain Planning component of Green Supply Chain Performance.			Accept alternate hypothesis
52	$H32_0$	There is no definite order in which the five Green Supply Chain Practices namely Environmental Certification; Pollution Prevention; Life Cycle Assessment; Design for Environment; and Reverse Logistics impact the Green Supply Chain Procurement component of Green Supply Chain Performance.	The null hypothesis is rejected and the alternate hypothesis is accepted on the basis of the evidence provided by Table 6, Table 11, Table 12, Table 13, Table 39, Table 41 and Figure 13.		Reject null hypothesis
	H32a	There is a definite order in which the five Green Supply Chain Practices namely Environmental Certification; Pollution Prevention; Life Cycle Assessment; Design for Environment; and Reverse Logistics impact the Green Supply Chain Procurement component of Green Supply Chain Performance.			Accept alternate hypothesis
53	$H33_0$	There is no definite order in which the five Green Supply Chain Practices namely Environmental Certification; Pollution Prevention; Life Cycle Assessment; Design for	The null hypothesis is rejected and the alternate hypothesis is accepted on the basis of the evidence provided by Table 6, Table 14, Table 15, Table 16, Table 39, Table 41		Reject null hypothesis

Sr. No.	Null Hypothesis / Alternate Hypothesis	Hypothesis	Pearson's correlation coefficient	p value for Significance level (α = 0.05)	Decision about the hypothesis
		Environment; and Reverse Logistics impact the Green Supply Chain Execution (Production) component of Green Supply Chain Performance.	and Figure 14.		
	H33a	There is a definite order in which the five Green Supply Chain Practices namely Environmental Certification; Pollution Prevention; Life Cycle Assessment; Design for Environment; and Reverse Logistics impact the Green Supply Chain Execution (Production) component of Green Supply Chain Performance.			Accept alternate hypothesis
54	$H34_0$	There is no definite order in which the five Green Supply Chain Practices namely Environmental Certification; Pollution Prevention; Life Cycle Assessment; Design for Environment; and Reverse Logistics impact the Green Supply Chain Execution (Logistics) component of Green Supply Chain Performance.	The null hypothesis is rejected and the alternate hypothesis is accepted on the basis of the evidence provided by Table 6, Table 17, Table 18, Table 19, Table 39, Table 41 and Figure 15.		Reject null hypothesis
	H34a	There is a definite order in which the five Green Supply Chain Practices namely Environmental Certification; Pollution Prevention; Life Cycle Assessment; Design for Environment; and Reverse Logistics impact the Green Supply Chain Execution (Logistics) component of Green Supply Chain Performance.			Accept alternate hypothesis
55	$H35_0$	There is no definite order in which the five Green Supply Chain Practices namely Environmental Certification; Pollution Prevention; Life Cycle Assessment; Design for Environment; and Reverse Logistics impact the Green Supply Chain Execution (Packing) component of Green Supply Chain Performance.	The null hypothesis is rejected and the alternate hypothesis is accepted on the basis of the evidence provided by Table 6, Table 20, Table 21, Table 22, Table 39, Table 41 and Figure 16.		Reject null hypothesis

Sr. No.	Null Hypothesis / Alternate Hypothesis	Hypothesis	Pearson's correlation coefficient	p value for Significance level (α = 0.05)	Decision about the hypothesis
	$H35_a$	There is a definite order in which the five Green Supply Chain Practices namely Environmental Certification; Pollution Prevention; Life Cycle Assessment; Design for Environment; and Reverse Logistics impact the Green Supply Chain Execution (Packing) component of Green Supply Chain Performance.			Accept alternate hypothesis
56	$H36_0$	There is no definite order in which the five Green Supply Chain Practices namely Environmental Certification; Pollution Prevention; Life Cycle Assessment; Design for Environment; and Reverse Logistics impact the Green Supply Chain Execution (Marketing) component of Green Supply Chain Performance.	The null hypothesis is rejected and the alternate hypothesis is accepted on the basis of the evidence provided by Table 6, Table 23, Table 24, Table 25, Table 39, Table 41 and Figure 17.		Reject null hypothesis
	$H36_a$	There is a definite order in which the five Green Supply Chain Practices namely Environmental Certification; Pollution Prevention; Life Cycle Assessment; Design for Environment; and Reverse Logistics impact the Green Supply Chain Execution (Marketing) component of Green Supply Chain Performance.			Accept alternate hypothesis
57	$H37_0$	There is no definite order in which the five Green Supply Chain Practices namely Environmental Certification; Pollution Prevention; Life Cycle Assessment; Design for Environment; and Reverse Logistics impact the Green Supply Chain Execution (Supply Loops) component of Green Supply Chain Performance.	The null hypothesis is rejected and the alternate hypothesis is accepted on the basis of the evidence provided by Table 6, Table 26, Table 27, Table 28, Table 39, Table 41 and Figure 18.		Reject null hypothesis
	$H37_a$	There is a definite order in which the five Green Supply Chain Practices namely Environmental Certification; Pollution Prevention; Life Cycle Assessment; Design for Environment; and Reverse Logistics impact the Green Supply Chain Execution			Accept alternate hypothesis

Sr. No.	Null Hypothesis / Alternate Hypothesis	Hypothesis	Pearson's correlation coefficient	p value for Significance level (α = 0.05)	Decision about the hypothesis
		(Supply Loops) component of Green Supply Chain Performance.			
58	$H38_0$	There is no definite order in which the five Green Supply Chain Practices namely Environmental Certification; Pollution Prevention; Life Cycle Assessment; Design for Environment; and Reverse Logistics impact the Carbon Management component of Green Supply Chain Performance.	The null hypothesis is rejected and the alternate hypothesis is accepted on the basis of the evidence provided by Table 6, Table 29, Table 30, Table 31, Table 39, Table 41 and Figure 19.		Reject null hypothesis
	$H38_a$	There is a definite order in which the five Green Supply Chain Practices namely Environmental Certification; Pollution Prevention; Life Cycle Assessment; Design for Environment; and Reverse Logistics impact the Carbon Management component of Green Supply Chain Performance.			Accept alternate hypothesis
59	$H39_0$	There is no definite order in which the five Green Supply Chain Practices namely Environmental Certification; Pollution Prevention; Life Cycle Assessment; Design for Environment; and Reverse Logistics impact the Green Supply Chain Migration component of Green Supply Chain Performance.	The null hypothesis is rejected and the alternate hypothesis is accepted on the basis of the evidence provided by Table 6, Table 32, Table 33, Table 34, Table 39, Table 41 and Figure 20.		Reject null hypothesis
	$H39_a$	There is a definite order in which the five Green Supply Chain Practices namely Environmental Certification; Pollution Prevention; Life Cycle Assessment; Design for Environment; and Reverse Logistics impact the Green Supply Chain Migration component of Green Supply Chain Performance.			Accept alternate hypothesis

Sr. No.	Null Hypothesis / Alternate Hypothesis	Hypothesis	Pearson's correlation coefficient	p value for Significance level (α = 0.05)	Decision about the hypothesis
60	$H40_0$	There is no definite order in which the five Green Supply Chain Practices namely Environmental Certification; Pollution Prevention; Life Cycle Assessment; Design for Environment; and Reverse Logistics impact the Green Supply Chain Continuous Improvement component of Green Supply Chain Performance.	The null hypothesis is rejected and the alternate hypothesis is accepted on the basis of the evidence provided by Table 6, Table 35, Table 36, Table 37, Table 39, Table 41 and Figure 21.		Reject null hypothesis
	$H40_a$	There is a definite order in which the five Green Supply Chain Practices namely Environmental Certification; Pollution Prevention; Life Cycle Assessment; Design for Environment; and Reverse Logistics impact the Green Supply Chain Continuous Improvement component of Green Supply Chain Performance.			Accept alternate hypothesis
61	$H41_0$	There is no definite order in which components of Green Supply Chain Practices jointly impact the components of Green Supply Chain Performance.	The null hypothesis is rejected and the alternate hypothesis is accepted on the basis of the evidence provided by Table 10, Table 13, Table 16, Table 19, Table 22, Table 25, Table 28, Table 31, Table 34, Table 37, Figure 12 and Figure 21.		Reject null hypothesis
	$H41_a$	There is a definite order in which components of Green Supply Chain Practices jointly impact the components of Green Supply Chain Performance.			Accept alternate hypothesis

From the first fifty hypotheses i.e. hypotheses from serial number 1 to serial number 50 of Table 7 it is evident that on the basis of correlation analysis the five components of green supply chain practices are individually associated in varying degrees with the ten sub-construct components of green supply chain performance (Hypotheses H_1 to H_{30}). Also it is evident from table 7 that the five green supply chain practices jointly impact individual component measures of Green Supply Chain Performance (Hypotheses H_{31} to H_{40}). Finally hypothesis H_{41} in table 7 makes it evident that there is a definite order of influence of the five green supply chain practices on individual component measures of Green Supply Chain Performance.

REGRESSION ANALYSIS

Ten dependent sub-constructs and five independent sub-constructs were identified. Accordingly ten models and fifty (10 x 5 = 50) hypotheses emerged for doing regression analysis. Each of these models was tested one by one for studying the joint impact of the independent sub-constructs (i.e. components of GSC Practices) on a particular dependent sub-construct (component measures of GSC Performance). Accordingly, all the fifty hypotheses were stated in their null and alternate form as shown in table 7 for testing them by using multiple regression analysis. Also additional eleven hypotheses pertaining to the ordering of components of GSC Practices jointly influencing the component measures of GSC Performance are stated in their null and alternate form in table 7. In all sixty-one hypotheses are put to test.

Model 1. Green Supply Chain Planning (GSCPLAN)

Model 1 is associated with the five hypotheses namely H_1, H_7, H_{13}, H_{19} and H_{25} wherein the dependent construct is GSCPLAN (Green Supply Chain Planning) and the independent sub-constructs are EC, PP, RL, LCA and DFE. Model 1 is depicted in figure 2.

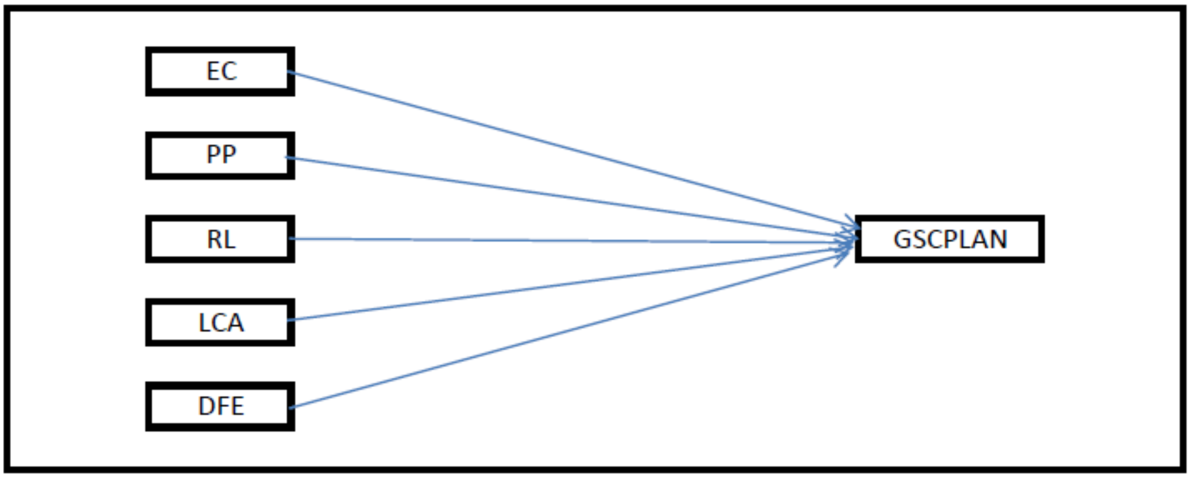

Figure 2. Model 1-Impact of GSC Practices on GSCPLAN

The summary of the multiple regression output for model 1 is as follows:

When the five independent or predictor constructs namely EC, PP, RL, LCA and DFE are jointly regressed against the dependent or criterion construct GSCPLAN, which is interval scaled, the five individual correlations collapse into what is called as a multiple r or multiple correlation. The square of the multiple r which is also commonly known as R-square or R^2 is indicative of the amount of variance in the dependent construct explained jointly by the predictors. In the case of model 1, the $R^2 = 0.9606$ which means that 96.06 % of the variance of the dependent construct GSCPLAN is significantly explained jointly by the predictors EC, PP, RL, LCA and DFE at a significance level of $\alpha = 0.05$ ($p < 0.0001$), i.e., this does not hold true 0.0001 % of times. Table 8 shows the analysis of variance for model 1. Table 9 shows the computation of R^2 value for model 1. Table 10 shows the computation of parameter estimates for model 1. Thus, the hypotheses H_{1a}, H_{7a}, H_{13a}, H_{19a} and H_{25a} are substantiated. Since some of the parameter estimates are negative, as shown in the table 10, there appears to be an existence of multicollinearity. The effect of multicollinearity can be removed by using Principal Component Regression. On applying Principal Component Regression the centered and scaled data is as shown in the figure 35 and the new (revised) parameter estimates are obtained as shown in the table 36. Since all the revised parameter estimates are now positive, the effect of multicollinearity is no more there. So these revised parameter estimates are usable. They are the standardized coefficients of the corresponding multiple regression equation for studying the impact of Green Supply Chain Practices on the GSCPLAN component of Green Supply Chain Performance. But what remains to be explored is the order in which the five Green Supply Chain Practices impact the GSCPLAN component of Green Supply Chain Performance. Sorting the revised parameter estimates shown in table 36 in the descending order of magnitude gives the descending order in which the corresponding Green Supply Chain Practices impact the GSCPLAN component of Green Supply Chain Performance. The Green Supply Chain Practices in the descending order in which they influence the GSCPLAN component of GSC performance is as follows: LCA, EC, PP, DFE and RL. The corresponding parameter estimates or standardized coefficients in that order are as follows: 0.352077842, 0.311427967, 0.296521179, 0.223926708 and 0.196058173. Accordingly, model 1 yields the following regression equation to explain the impact of the five Green Supply Chain Practices on the GSCPLAN component of Green Supply Chain Performance:

GSCPLAN = -1.733112398 + (0.311427967)(EC) + (0.296521179) (PP) + (0.196058173) (RL) + (0.352077842) (LCA) + (0.223926708) (DFE)

Table 8. ANOVA for model 1: Dependent variable: GSCPLAN

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	59.29042	11.85808	473.51	<.0001
Error	97	2.42919	0.02504		
Corrected Total	102	61.71961			

Table 9. Computation of R^2 for model 1

Root MSE	0.15825	R-Square	0.9606
Dependent Mean	4.40194	Adj R-Sq	0.9586
Coeff Var	3.59501		

Table 10. Paramaeter estimates for model1

Parameter Estimates						
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	1	-0.01935	0.24227	-0.08	0.9365	0
EC	1	-0.47431	0.10377	-4.57	<.0001	12.30377
PP	1	1.11008	0.13184	8.42	<.0001	28.90365
RL	1	0.20592	0.05503	3.74	0.0003	6.50446
LCA	1	-0.59159	0.12174	-4.86	<.0001	16.61923
DFE	1	0.79340	0.04851	16.36	<.0001	4.55562

Model 2. Green Supply Chain Procurement (GSCPROC)

Model 2 is associated with the five hypotheses namely H_2, H_8, H_{14}, H_{20} and H_{26} wherein the dependent construct is GSCPROC (Green Supply Chain Procurement) and the independent sub-constructs are EC, PP, RL, LCA and DFE. Model 2 is depicted in figure 3.

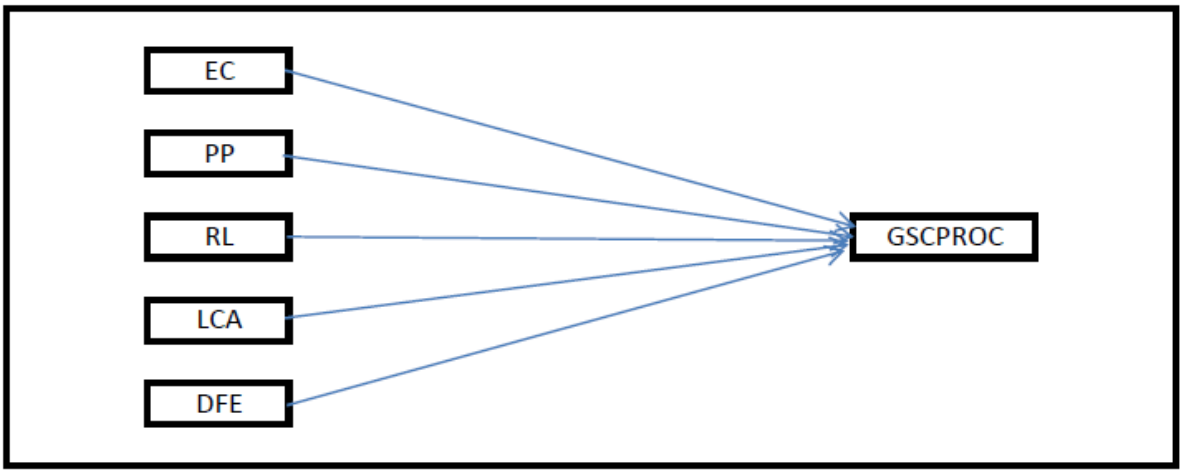

Figure 3. Model 2-Impact of GSC Practices on GSCPROC

The summary of the multiple regression output for model 2 is as follows:
When the five independent or predictor constructs namely EC, PP, RL, LCA and DFE are jointly regressed against the dependent or criterion construct GSCPROC, which is interval scaled, the five individual correlations collapse into what is called as a multiple r or multiple correlation. The square of the multiple r which is also commonly known as R-square or R^2 is indicative of the amount of variance in the dependent construct explained jointly by the predictors. In the case of model 2, the $R^2 = 0.9901$ which means that 99.01 % of the variance of the dependent construct GSCPROC is significantly explained jointly by the predictors EC, PP, RL, LCA and DFE at a significance level of $\alpha = 0.05$ ($p < 0.0001$), i.e., this does not hold true 0.0001 % of times. Table 11 shows the analysis of variance for model 2. Table 12 shows the computation of R^2 value for model 2. Table 13 shows the computation of parameter estimates for model 2. Thus, the hypotheses H_{2a}, H_{8a}, H_{14a}, H_{20a} and H_{26a} are substantiated. Since some of the parameter estimates are negative, as shown in the table 13 there appears to be an existence of multicollinearity. The effect of multicollinearity can be removed by using an advanced statistical analysis technique called as Principal Component Regression. On applying Principal Component Regression the centered and scaled data is as shown in the figure 20 and the new (revised) parameter estimates are obtained as shown in the table 21. Since all the revised parameter estimates are now positive, the effect of multicollinearity is no more there. So these revised parameter estimates are usable. They are the standardized coefficients of the corresponding multiple regression equation for studying the impact of Green Supply Chain Practices on the GSCPROC component of Green Supply Chain Performance. But what remains to be explored is the order in which the five Green Supply Chain Practices impact the GSCPROC component of Green Supply Chain Performance. Sorting the revised parameter estimates shown in table 36 in the descending order of magnitude gives the descending order in which the corresponding Green Supply Chain Practices impact the GSCPROC component of Green Supply Chain Performance. The Green Supply Chain Practices in the descending order in which they influence the GSCPROC component of GSC performance is as follows: LCA, EC, PP, DFE and RL. The corresponding parameter estimates or standardized coefficients in that order are as follows: 0.362416519, 0.320572971, 0.305228448, 0.230502259 and 0.201815371. Accordingly, model 2 yields the following regression equation to explain the impact of the five Green Supply Chain Practices on the GSCPROC component of Green Supply Chain Performance:

GSCPROC = -1.887141383 + (0.320572971)(EC) + (0.305228448) (PP) + (0.201815371) (RL) + (0.362416519) (LCA) + (0.230502259) (DFE)

Table 11. ANOVA for model 2: Dependent variable: GSCPROC

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	61.36375	12.27275	1940.05	<.0001
Error	97	0.61362	0.00633		
Corrected Total	102	61.97737			

Table 12. Computation of R^2 for model 2

Root MSE	0.07954	R-Square	0.9901
Dependent Mean	4.42807	Adj R-Sq	0.9896
Coeff Var	1.79618		

Table 13. Parameter estimates for model 2

Parameter Estimates						
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	1	-0.30400	0.12176	-2.50	0.0142	0
EC	1	-0.26830	0.05216	-5.14	<.0001	12.30377
PP	1	0.88997	0.06626	13.43	<.0001	28.90365
RL	1	0.36609	0.02766	13.24	<.0001	6.50446
LCA	1	-0.64308	0.06118	-10.51	<.0001	16.61923
DFE	1	0.80498	0.02438	33.02	<.0001	4.55562

Model 3. Green Supply Chain Execution - Production (GSCEXPROD)

Model 3 is associated with the five hypotheses namely H_{3A}, H_{9A}, H_{15A}, H_{21A} and H_{27A} wherein the dependent construct is GSCEXPROD (Green Supply Chain Execution-Production) and the independent sub-constructs are EC, PP, RL, LCA and DFE. Model 3 is depicted in figure 4.

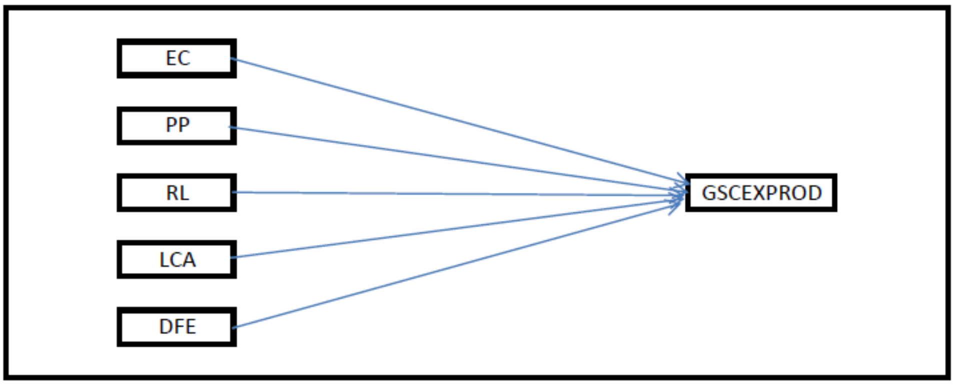

Figure 4. Model 3-Impact of GSC Practices on GSCEXPROD

The summary of the multiple regression output for model 3 is as follows:
When the five independent or predictor constructs namely EC, PP, RL, LCA and DFE are jointly regressed against the dependent or criterion construct GSCEXPROD, which is interval scaled, the five individual correlations collapse into what is called as a multiple r or multiple correlation. The square of the multiple r which is also commonly known as R-square or R^2 is

indicative of the amount of variance in the dependent construct explained jointly by the predictors. In the case of model 3, the $R^2 = 0.9561$ which means that 95.61 % of the variance of the dependent construct GSCEXPROD is significantly explained jointly by the predictors EC, PP, RL, LCA and DFE at a significance level of $\alpha = 0.05$ ($p < 0.0001$), i.e., this does not hold true 0.0001 % of times. Table 14 shows the analysis of variance for model 3. Table 15 shows the computation of R^2 value for model 3. Table 16 shows the computation of parameter estimates for model 3. Thus, the hypotheses H_{3Aa}, H_{9Aa}, H_{15Aa}, H_{21Aa} and H_{27Aa} are substantiated. Since some of the parameter estimates are negative, as shown in the table 16 there appears to be an existence of multicollinearity. The effect of multicollinearity can be removed by using an advanced statistical analysis technique called as Principal Component Regression. On applying Principal Component Regression the centered and scaled data is as shown in the figure 20 and the new (revised) parameter estimates are obtained as shown in the table 21. Since all the revised parameter estimates are now positive, the effect of multicollinearity is no more there. So these revised parameter estimates are usable. They are the standardized coefficients of the corresponding multiple regression equation for studying the impact of Green Supply Chain Practices on the GSCEXPROD component of Green Supply Chain Performance. But what remains to be explored is the order in which the five Green Supply Chain Practices impact the GSCEXPROD component of Green Supply Chain Performance. Sorting the revised parameter estimates shown in table 21 in the descending order of magnitude gives the descending order in which the corresponding Green Supply Chain Practices impact the GSCEXPROD component of Green Supply Chain Performance. The Green Supply Chain Practices in the descending order in which they influence the GSCEXPROD component of GSC performance is as follows: LCA, EC, PP, DFE and RL. The corresponding parameter estimates or standardized coefficients in that order are as follows: 0.250726008, 0.221777918, 0.211162313, 0.159465444 and 0.13961936. Accordingly, model 3 yields the following regression equation to explain the impact of the five Green Supply Chain Practices on the GSCEXPROD component of Green Supply Chain Performance:

$$GSCEXPROD = 0.217714868 + (0.221777918)(EC) + (0.211162313)(PP) + (0.139619360)(RL) + (0.250726008)(LCA) + (0.159465444)(DFE)$$

Table 14. ANOVA for model 3: Dependent variable: GSCEXPROD

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	29.53856	5.90771	422.66	<.0001
Error	97	1.35583	0.01398		
Corrected Total	102	30.89439			

Table 15. Computation of R^2 for model 3

Root MSE	0.11823	R-Square	0.9561
Dependent Mean	4.58669	Adj R-Sq	0.9539
Coeff Var	2.57761		

Table 16. Parameter estimates for model 3

Parameter Estimates						
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	1	0.50128	0.18099	2.77	0.0067	0
EC	1	-0.33418	0.07753	-4.31	<.0001	12.30377
PP	1	0.93933	0.09850	9.54	<.0001	28.90365
RL	1	-0.34678	0.04112	-8.43	<.0001	6.50446
LCA	1	0.55240	0.09095	6.07	<.0001	16.61923
DFE	1	-0.01472	0.03624	-0.41	0.6855	4.55562

Model 4. Green Supply Chain Execution - Logistics (GSCEXLOG)

Model 4 is associated with the five hypotheses namely H_{3B}, H_{9B}, H_{15B}, H_{21B} and H_{27B} wherein the dependent construct is GSCEXLOG (Green Supply Chain Execution- Logistics) and the independent sub-constructs are EC, PP, RL, LCA and DFE. Model 4 is depicted in figure 5.

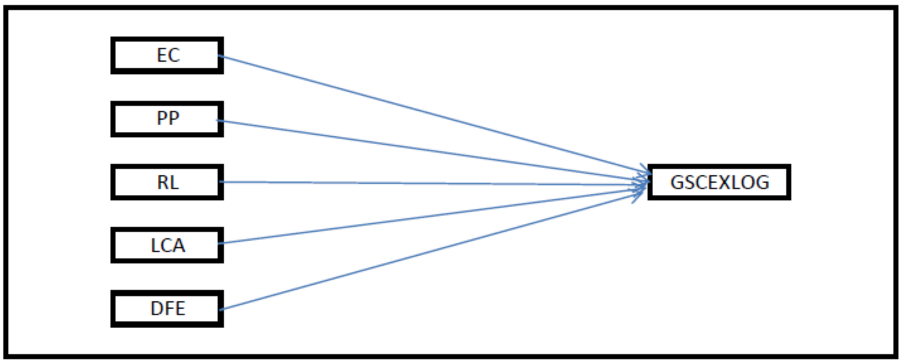

Figure 5. Model 4-Impact of GSC Practices on GSCEXLOG

The summary of the multiple regression output for model 4 is as follows:
When the five independent or predictor constructs namely EC, PP, RL, LCA and DFE are jointly regressed against the dependent or criterion construct GSCEXLOG, which is interval scaled, the five individual correlations collapse into what is called as a multiple r or multiple correlation. The square of the multiple r which is also commonly known as R-square or R^2 is indicative of the amount of variance in the dependent construct explained jointly by the predictors. In the case of model 4, the R^2 = 0.9050 which means that 90.50 % of the variance of the dependent construct GSCEXLOG is significantly explained jointly by the predictors EC, PP, RL, LCA and DFE at a significance level of $\alpha = 0.05$ ($p < 0.0001$), i.e., this does not hold true 0.0001 % of times. Table 17 shows the analysis of variance for model 4. Table 18 shows the computation of R^2 value for model 4. Table 19 shows the computation of parameter estimates for model 4.Thus, the hypotheses H_{3Ba}, H_{9Ba}, H_{15Ba}, H_{21Ba} and H_{27Ba} are substantiated. Since some of the parameter estimates are negative, as shown in the table 19 there appears to be an existence of multicollinearity. The effect of multicollinearity can be removed by using an advanced statistical analysis technique called as Principal Component Regression. On applying Principal Component Regression the centered and scaled data is as shown in the figure 20 and the new (revised) parameter estimates are obtained as shown in the table 21. Since all the revised parameter estimates are now positive, the effect of multicollinearity is no more there. So these revised parameter estimates are usable. They are the standardized coefficients of the corresponding multiple regression equation for studying the impact of Green Supply Chain

Practices on the GSCEXLOG component of Green Supply Chain Performance. But what remains to be explored is the order in which the five Green Supply Chain Practices impact the GSCEXLOG component of Green Supply Chain Performance. Sorting the revised parameter estimates shown in table 21 in the descending order of magnitude gives the descending order in which the corresponding Green Supply Chain Practices impact the GSCEXLOG component of Green Supply Chain Performance. The Green Supply Chain Practices in the descending order in which they influence the GSCEXLOG component of GSC performance is as follows: LCA, EC, PP, DFE and RL. The corresponding parameter estimates or standardized coefficients in that order are as follows: 0.173690515, 0.153636718, 0.146282754, 0.110469733 and 0.096721352. Accordingly, model 4 yields the following regression equation to explain the impact of the five Green Supply Chain Practices on the GSCEXLOG component of Green Supply Chain Performance:

GSCEXLOG = 1.344753781 + (0.153636718)(EC) + (0.146282754) (PP) + (0.096721352) (RL) + (0.173690515) (LCA) + (0.110469733) (DFE)

Table 17. ANOVA for model 4: Dependent variable: GSCEXLOG

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	17.56953	3.51391	184.84	<.0001
Error	97	1.84403	0.01901		
Corrected Total	102	19.41357			

Table 18. Computation of R2 for model 4

Root MSE	0.13788	R-Square	0.9050
Dependent Mean	4.37136	Adj R-Sq	0.9001
Coeff Var	3.15415		

Table 19. Parameter estimates for model 4

Parameter Estimates						
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	1	0.91554	0.21108	4.34	<.0001	0
EC	1	-0.08449	0.09042	-0.93	0.3524	12.30377
PP	1	0.27390	0.11487	2.38	0.0191	28.90365
RL	1	-0.39933	0.04795	-8.33	<.0001	6.50446
LCA	1	0.70384	0.10607	6.64	<.0001	16.61923
DFE	1	0.15971	0.04226	3.78	0.0003	4.55562

Model 5. Green Supply Chain Execution -Packaging (GSCEXPACK)

Model 5 is associated with the five hypotheses namely H_{3C}, H_{9C}, H_{15C}, H_{21C} and H_{27C} wherein the dependent construct is GSCEXPACK (Green Supply Chain Execution-Packaging) and the independent sub-constructs are EC, PP, RL, LCA and DFE. Model 5 is depicted in figure 6.

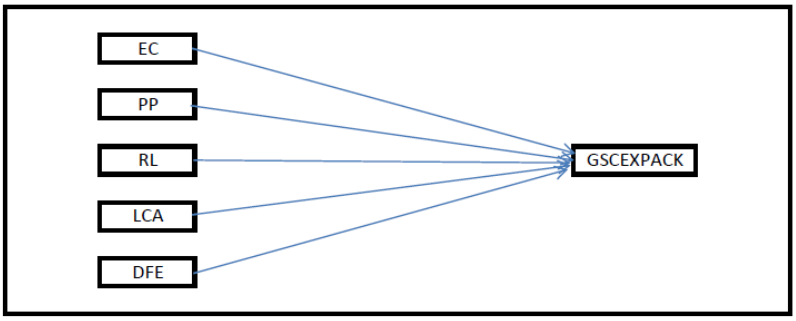

Figure 6. Model 5-Impact of GSC Practices on GSCEXPACK

The summary of the multiple regression output for model 5 is as follows:
When the five independent or predictor constructs namely EC, PP, RL, LCA and DFE are jointly regressed against the dependent or criterion construct GSCEXPACK, which is interval scaled, the five individual correlations collapse into what is called as a multiple r or multiple correlation. The square of the multiple r which is also commonly known as R-square or R^2 is indicative of the amount of variance in the dependent construct explained jointly by the predictors. In the case of model 5, the $R^2 = 0.9286$ which means that 92.86 % of the variance of the dependent construct GSCEXPACK is significantly explained jointly by the predictors EC, PP, RL, LCA and DFE at a significance level of $\alpha = 0.05$ ($p < 0.0001$), i.e., this does not hold true 0.0001 % of times. Table 20 shows the analysis of variance for model 5. Table 21 shows the computation of R^2 value for model 5. Table 22 shows the computation of parameter estimates for model 5.Thus, the hypotheses H_{3Ca}, H_{9Ca}, H_{15Ca}, H_{21Ca} and H_{27Ca} are substantiated. Since some of the parameter estimates are negative, as shown in the table 22 there appears to be an existence of multicollinearity. The effect of multicollinearity can be removed by using an advanced statistical analysis technique called as Principal Component Regression. On applying Principal Component Regression the centered and scaled data is as shown in the figure 20 and the new (revised) parameter estimates are obtained as shown in the table 21. Since all the revised parameter estimates are now positive, the effect of multicollinearity is no more there. So these revised parameter estimates are usable. They are the standardized coefficients of the corresponding multiple regression equation for studying the impact of Green Supply Chain Practices on the GSCEXPACK component of Green Supply Chain Performance. But what remains to be explored is the order in which the five Green Supply Chain Practices impact the GSCEXPACK component of Green Supply Chain Performance. Sorting the revised parameter estimates shown in table 21 in the descending order of magnitude gives the descending order in which the corresponding Green Supply Chain Practices impact the GSCEXPACK component of Green Supply Chain Performance. The Green Supply Chain Practices in the descending order in which they influence the GSCEXPACK component of GSC performance is as follows: LCA, EC, PP, DFE and RL. The corresponding parameter estimates or standardized coefficients in that order are as follows: 0.180826261, 0.159948591, 0.152292503, 0.115008172 and 0.100694966. Accordingly, model 5 yields the following regression equation to explain the impact of the five Green Supply Chain Practices on the GSCEXPACK component of Green Supply Chain Performance:

GSCEXPACK = 1.630605607 + (0.159948591)(EC) + (0.152292503) (PP) + (0.100694966) (RL) + (0.180826261) (LCA) + (0.115008172) (DFE)

Table 20. ANOVA for model 5: GSCEXPACK

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	15.98130	3.19626	252.34	<.0001
Error	97	1.22865	0.01267		
Corrected Total	102	17.20995			

Table 21. Computation of R^2 for model 5

Root MSE	0.11255	R-Square	0.9286
Dependent Mean	4.78155	Adj R-Sq	0.9249
Coeff Var	2.35375		

Table 22. Parameter estimates for model 5

Parameter Estimates						
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	1	0.50367	0.17230	2.92	0.0043	0
EC	1	0.45734	0.07380	6.20	<.0001	12.30377
PP	1	-0.24915	0.09377	-2.66	0.0092	28.90365
RL	1	-0.08176	0.03914	-2.09	0.0393	6.50446
LCA	1	1.02099	0.08658	11.79	<.0001	16.61923
DFE	1	-0.26049	0.03450	-7.55	<.0001	4.55562

Model 6. Green Supply Chain Execution - Marketing (GSCEXMARK)

Model 6 is associated with the five hypotheses namely H_{3D}, H_{9D}, H_{15D}, H_{21D} and H_{27D} wherein the dependent construct is GSCEXMARK (Green Supply Chain Execution-Marketing) and the independent sub-constructs are EC, PP, RL, LCA and DFE. Model 6 is depicted in figure 7.

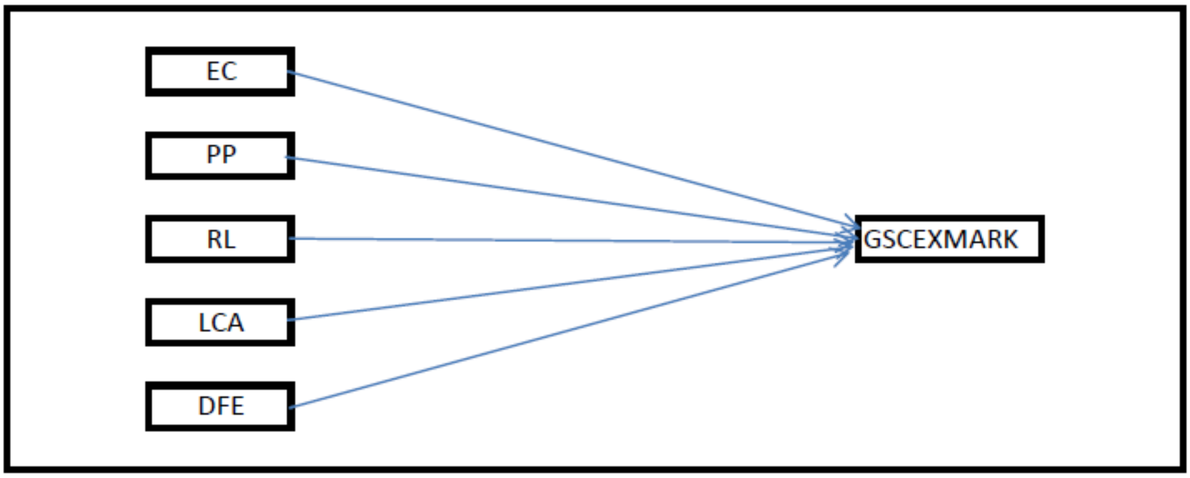

Figure 7. Model 6-Impact of GSC Practices on GSCEXMARK

The summary of the multiple regression output for model 6 is as follows:

When the five independent or predictor constructs namely EC, PP, RL, LCA and DFE are jointly regressed against the dependent or criterion construct GSCEXMARK, which is interval scaled, the five individual correlations collapse into what is called as a multiple r or multiple correlation. The square of the multiple r which is also commonly known as R-square or R^2 is indicative of the amount of variance in the dependent construct explained jointly by the predictors. In the case of model 6, the $R^2 = 0.9403$ which means that 94.03 % of the variance of the dependent construct GSCEXMARK is significantly explained jointly by the predictors EC, PP, RL, LCA and DFE at a significance level of $\alpha = 0.05$ ($p < 0.0001$), i.e., this does not hold true 0.0001 % of times. Table 23 shows the analysis of variance for model 6. Table 24 shows the computation of R^2 value for model 6. Table 25 shows the computation of parameter estimates for model 6. Thus, the hypotheses H_{3Da}, H_{9Da}, H_{15Da}, H_{21Da} and H_{27Da} are substantiated. Since some of the parameter estimates are negative, as shown in the table 25 there appears to be an existence of multicollinearity. The effect of multicollinearity can be removed by using an advanced statistical analysis technique called as Principal Component Regression. On applying Principal Component Regression the centered and scaled data is as shown in the figure 20 and the new (revised) parameter estimates are obtained as shown in the table 21. Since all the revised parameter estimates are now positive, the effect of multicollinearity is no more there. So these revised parameter estimates are usable. They are the standardized coefficients of the corresponding multiple regression equation for studying the impact of Green Supply Chain Practices on the GSCEXMARK component of Green Supply Chain Performance. But what remains to be explored is the order in which the five Green Supply Chain Practices impact the GSCEXMARK component of Green Supply Chain Performance. Sorting the revised parameter estimates shown in table 21 in the descending order of magnitude gives the descending order in which the corresponding Green Supply Chain Practices impact the GSCEXMARK component of Green Supply Chain Performance. The Green Supply Chain Practices in the descending order in which they influence the GSCEXMARK component of GSC performance is as follows: EC, PP, RL, LCA and DFE. The corresponding parameter estimates or standardized coefficients in that order are as follows: 0.309560444, 0.294743046, 0.194882481, 0.349966556 and 0.222583898. Accordingly, model 6 yields the following regression equation to explain the impact of the five Green Supply Chain Practices on the GSCEXMARK component of Green Supply Chain Performance:

GSCEXMARK = -1.942924586 + (0.309560444)(EC) + (0.294743046) (PP) + (0.194882481) (RL) + (0.349966556) (LCA) + (0.222583898) (DFE)

Table 23. ANOVA for model 6: Dependent Variable: GSCEXMARK

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	102.62098	20.52420	305.41	<.0001
Error	97	6.51858	0.06720		
Corrected Total	102	109.13956			

Table 24. Computation of R^2 for model 6

Root MSE	0.25923	R-Square	0.9403
Dependent Mean	4.15534	Adj R-Sq	0.9372
Coeff Var	6.23856		

Table 25. Parameter estimates for model 6

Parameter Estimates						
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	1	-0.92569	0.39686	-2.33	0.0217	0
EC	1	-0.95163	0.16999	-5.60	<.0001	12.30377
PP	1	0.16697	0.21598	0.77	0.4413	28.90365
RL	1	-0.00758	0.09015	-0.08	0.9332	6.50446
LCA	1	0.42019	0.19942	2.11	0.0377	16.61923
DFE	1	1.53564	0.07946	19.33	<.0001	4.55562

Model 7. Green Supply Chain Execution – Supply Loops (GSCEXSL)

Model 7 is associated with the five hypotheses namely H_{3E}, H_{9E}, H_{15E}, H_{21E} and H_{27E} wherein the dependent construct is GSCEXSL (Green Supply Chain Execution-Supply Loops) and the independent sub-constructs are EC, PP, RL, LCA and DFE. Model 7 is depicted in figure 8.

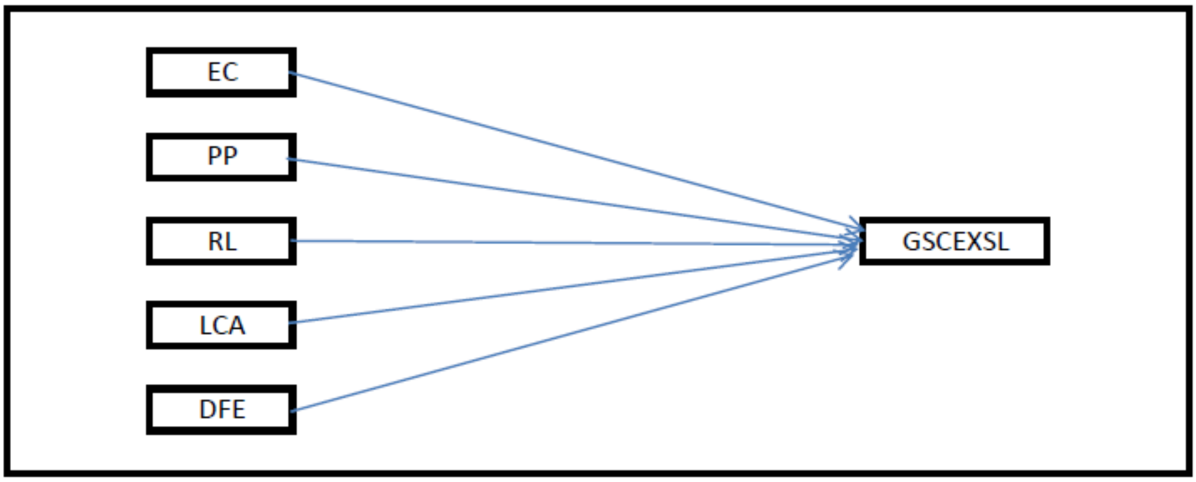

Figure 8. Model 7-Impact of GSC Practices on GSCEXSL

The summary of the multiple regression output for model 7 is as follows:

When the five independent or predictor constructs namely EC, PP, RL, LCA and DFE are jointly regressed against the dependent or criterion construct GSCEXSL, which is interval scaled, the five individual correlations collapse into what is called as a multiple r or multiple correlation. The square of the multiple r which is also commonly known as R-square or R^2 is indicative of the amount of variance in the dependent construct explained jointly by the predictors. In the case of model 7, the $R^2 = 0.8792$ which means that 87.92 % of the variance of the dependent construct GSCEXSL is significantly explained jointly by the predictors EC, PP, RL, LCA and DFE at a significance level of $\alpha = 0.05$ ($p < 0.0001$), i.e., this does not hold true 0.0001 % of times. Table 26 shows the analysis of variance for model 7. Table 27 shows the computation of R^2 value for model 7. Table 28 shows the computation of parameter estimates for model 7.Thus, the hypotheses H_{3Ea}, H_{9Ea}, H_{15Ea}, H_{21Ea} and H_{27Ea} are substantiated. Since some of the parameter estimates are negative, as shown in the table 28 there appears to be an existence of multicollinearity. The effect of multicollinearity can be removed by using an advanced statistical analysis technique called as Principal Component Regression. On applying Principal Component Regression the centered and scaled data is as shown in the figure 20 and the new (revised) parameter estimates are obtained as shown in the table 21. Since all the revised parameter estimates are now positive, the effect of multicollinearity is no more there. So these revised parameter estimates are usable. They are the standardized coefficients of the corresponding multiple regression equation for studying the impact of Green Supply Chain Practices on the GSCEXSL component of Green Supply Chain Performance. But what remains to be explored is the order in which the five Green Supply Chain Practices impact the GSCEXSL component of Green Supply Chain Performance. Sorting the revised parameter estimates shown in table 21 in the descending order of magnitude gives the descending order in which the corresponding Green Supply Chain Practices impact the GSCEXSL component of Green Supply Chain Performance. The Green Supply Chain Practices in the descending order in which they influence the GSCEXSL component of GSC performance is as follows: LCA, EC, PP, DFE and RL. The corresponding parameter estimates or standardized coefficients in that order are as follows: 0.118031818, 0.10440421, 0.099406806, 0.075069979 and 0.065727233. Accordingly, model 7 yields the following regression equation to explain the impact of the five Green Supply Chain Practices on the GSCEXSL component of Green Supply Chain Performance:

GSCEXSL = 2.312194848 + (0.104404210)(EC) + (0.099406806) (PP) + (0.065727233) (RL) + (0.118031818) (LCA) + (0.075069979) (DFE)

Table 26. ANOVA for model 7: GSCEXSL

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	9.94681	1.98936	141.15	<.0001
Error	97	1.36711	0.01409		
Corrected Total	102	11.31392			

Table 27. Computation of R^2 for model 7

Root MSE	0.11872	R-Square	0.8792
Dependent Mean	4.36893	Adj R-Sq	0.8729
Coeff Var	2.71732		

Table 28. Parameter estimates for model 7

Parameter Estimates						
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	1	1.85549	0.18175	10.21	<.0001	0
EC	1	-0.06797	0.07785	-0.87	0.3848	12.30377
PP	1	-0.07875	0.09891	-0.80	0.4279	28.90365
RL	1	-0.23473	0.04129	-5.69	<.0001	6.50446
LCA	1	0.63599	0.09133	6.96	<.0001	16.61923
DFE	1	0.23923	0.03639	6.57	<.0001	4.55562

Model 8. Carbon Management (CM)

Model 8 is associated with the five hypotheses namely H_4, H_{10}, H_{16}, H_{22} and H_{28} wherein the dependent construct is CM (Carbon management) and the independent sub-constructs are EC, PP, RL, LCA and DFE. Model 8 is depicted in figure 9.

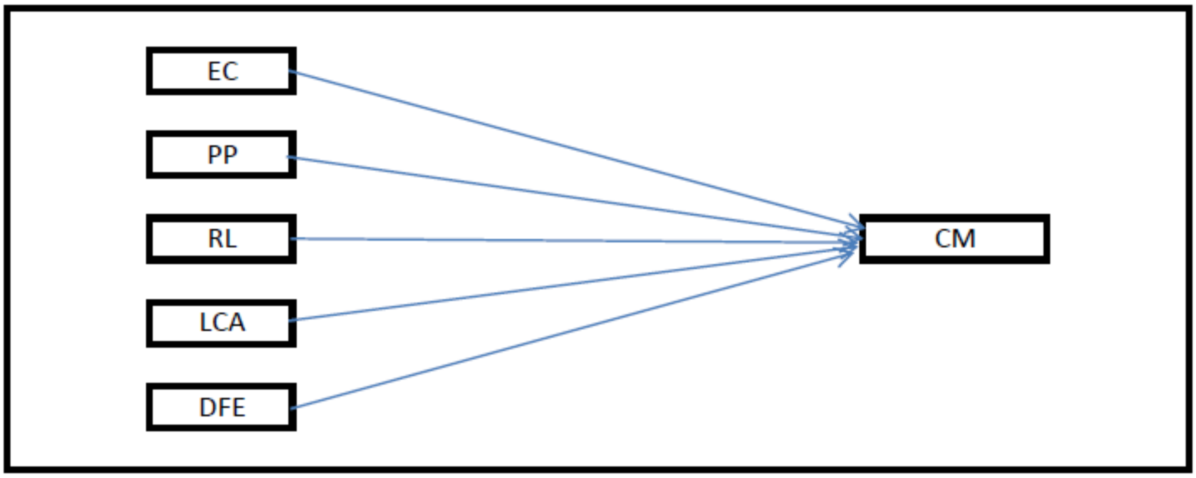

Figure 9. Model 8-Impact of GSC Practices on CM

The summary of the multiple regression output for model 8 is as follows:
When the five independent or predictor constructs namely EC, PP, RL, LCA and DFE are jointly regressed against the dependent or criterion construct CM, which is interval scaled, the five individual correlations collapse into what is called as a multiple r or multiple correlation. The square of the multiple r which is also commonly known as R-square or R^2 is indicative of the amount of variance in the dependent construct explained jointly by the predictors. In the case of model 8, the $R^2 = 0.9005$ which means that 90.05 % of the variance of the dependent construct CM is significantly explained jointly by the predictors EC, PP, RL, LCA and DFE at a significance level of $\alpha = 0.05$ ($p < 0.0001$), i.e., this does not hold true 0.0001 % of times. Table 29 shows the analysis of variance for model 8. Table 30 shows the computation of R^2 value for model 8. Table 31 shows the computation of parameter estimates for model 8.Thus, the hypotheses H_{4a}, H_{10a}, H_{16a}, H_{22a} and H_{28a} are substantiated. Since some of the parameter estimates are negative, as shown in the table 31 there appears to be an existence of multicollinearity. The effect of multicollinearity can be removed by using an advanced statistical analysis technique called as Principal Component Regression. On applying Principal Component Regression the centered and scaled data is as shown in the figure 20 and the new (revised) parameter estimates are obtained as shown in the table 21. Since all the revised parameter estimates are now positive, the effect of multicollinearity is no more there. So these revised parameter estimates are usable. They are the standardized coefficients of the corresponding multiple regression equation for studying the impact of Green Supply Chain Practices on the CM component of Green Supply Chain Performance. But what remains to be explored is the order in which the five Green Supply Chain Practices impact the CM component of Green Supply Chain Performance. Sorting the revised parameter estimates shown in table 21 in the descending order of magnitude gives the descending order in which the corresponding Green Supply Chain Practices impact the CM component of Green Supply Chain Performance. The Green Supply Chain Practices in the descending order in which they influence the CM component of GSC performance is as follows: LCA, EC, PP, DFE and RL. The corresponding parameter estimates or standardized coefficients in that order are as follows: 0.2470523, 0.2185283, 0.2080683, 0.1571289 and 0.1375736. Accordingly, model 8 yields the following regression equation to explain the impact of the five Green Supply Chain Practices on the CM component of Green Supply Chain Performance:

$$CM = -0.488033297 + (0.218528332)(EC) + (0.208068271)(PP) + (0.137573596)(RL) + (0.247052261)(LCA) + (0.157128887)(DFE)$$

Table 29. ANOVA for model 8: Dependent variable: CM

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	45.15051	9.03010	175.57	<.0001
Error	97	4.98898	0.05143		
Corrected Total	102	50.13949			

Table 30. Computation of R^2 for model 8

Root MSE	0.22679	R-Square	0.9005
Dependent Mean	3.81692	Adj R-Sq	0.8954
Coeff Var	5.94164		

Table 31. Parameter estimates for model 8

Parameter Estimates						
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	1	0.46613	0.34719	1.34	0.1825	0
EC	1	-0.46090	0.14872	-3.10	0.0025	12.30377
PP	1	-0.11285	0.18895	-0.60	0.5517	28.90365
RL	1	0.40711	0.07887	5.16	<.0001	6.50446
LCA	1	-0.05143	0.17446	-0.29	0.7688	16.61923
DFE	1	1.08979	0.06952	15.68	<.0001	4.55562

Model 9. Green Supply Chain Migration (GSCMIG)

Model 9 is associated with the five hypotheses namely H_5, H_{11}, H_{17}, H_{23} and H_{29} wherein the dependent construct is GSCMIG (Green Supply Chain Migration) and the independent sub-constructs are EC, PP, RL, LCA and DFE. Model 9 is depicted in figure 10.

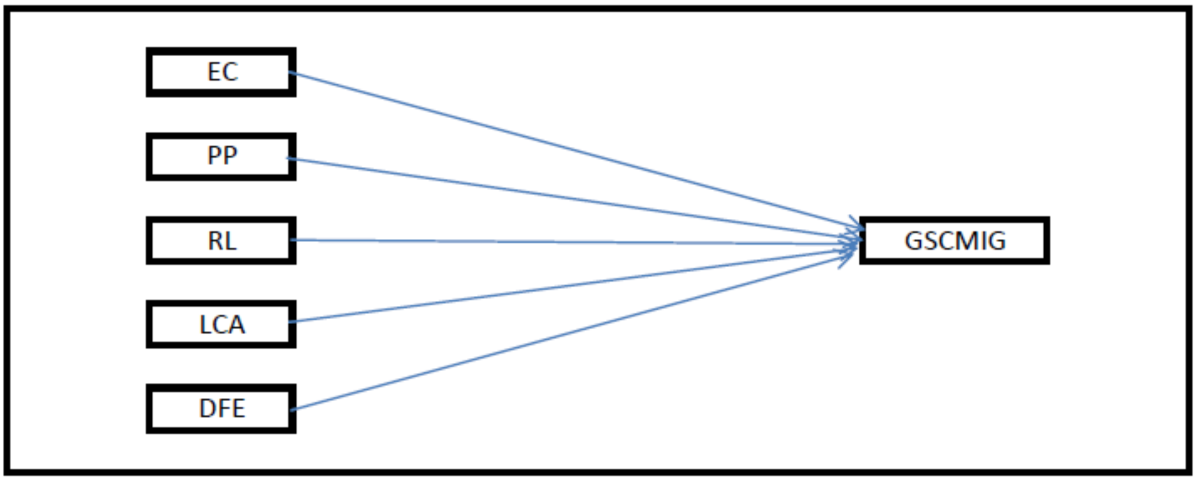

Figure 10. Model 9-Impact of GSC Practices on GSCMIG

The summary of the multiple regression output for model 9 is as follows:
When the five independent or predictor constructs namely EC, PP, RL, LCA and DFE are jointly regressed against the dependent or criterion construct GSCMIG, which is interval scaled, the five individual correlations collapse into what is called as a multiple r or multiple correlation. The square of the multiple r which is also commonly known as R-square or R^2 is indicative of the amount of variance in the dependent construct explained jointly by the predictors. In the case of model 9, the $R^2 = 0.8908$ which means that 89.08 % of the variance of the dependent construct GSCMIG is significantly explained jointly by the predictors EC, PP, RL, LCA and DFE at a significance level of $\alpha = 0.05$ ($p < 0.0001$), i.e., this does not hold true 0.0001 % of times. Table 32 shows the analysis of variance for model 9. Table 33 shows the computation of R^2 value for model 9. Table 34 shows the computation of parameter estimates for model 9. Thus, the hypotheses H_{5a}, H_{11a}, H_{17a}, H_{23a} and H_{29a} are substantiated. Since some of the parameter estimates are negative, as shown in the table 34 there appears to be an existence of multicollinearity. The effect of multi-co-linearity can be removed by using an advanced statistical analysis technique called as Principal Component Regression. On applying Principal Component Regression the centered and scaled data is as shown in the figure 20 and the new (revised) parameter estimates are obtained as shown in the table 21. Since all the revised parameter estimates are now positive, the effect of multicollinearity is no more there. So these revised parameter estimates are usable. They are the standardized coefficients of the corresponding multiple regression equation for studying the impact of Green Supply Chain Practices on the GSCMIG component of Green Supply Chain Performance. But what remains to be explored is the order in which the five Green Supply Chain Practices impact the GSCMIG component of Green Supply Chain Performance. Sorting the revised parameter estimates shown in table 21 in the descending order of magnitude gives the descending order in which the corresponding Green Supply Chain Practices impact the GSCPLAN component of Green Supply Chain Performance. The Green Supply Chain Practices in the descending order in which they influence the GSCMIG component of GSC performance is as follows: LCA, EC, PP, DFE and RL. The corresponding parameter estimates or standardized coefficients in that order are as follows: 0.173503, 0.15347085, 0.14612482, 0.11035047 and 0.09661693. Accordingly, model 1 yields the following regression equation to explain the impact of the five Green Supply Chain Practices on the GSCMIG component of Green Supply Chain Performance:

GSCMIG = 1.580545635 + (0.153470848)(EC) + (0.146124824) (PP) + (0.096616930) (RL) + (0.173502995) (LCA) + (0.110350467) (DFE)

Table 32. ANOVA for model 9: Dependent variable: GSCMIG

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	17.88517	3.57703	158.20	<.0001
Error	97	2.19328	0.02261		
Corrected Total	102	20.07845			

Table 33. Computation of R^2 for model 9

Root MSE	0.15037	R-Square	0.8908
Dependent Mean	4.60388	Adj R-Sq	0.8851
Coeff Var	3.26615		

Table 34. Parameter estimates for model 9

Parameter Estimates						
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	1	0.92149	0.23020	4.00	0.0001	0
EC	1	0.01409	0.09861	0.14	0.8867	12.30377
PP	1	-0.13072	0.12528	-1.04	0.2994	28.90365
RL	1	-0.24706	0.05229	-4.72	<.0001	6.50446
LCA	1	0.84481	0.11567	7.30	<.0001	16.61923
DFE	1	0.26198	0.04609	5.68	<.0001	4.55562

Model 10. Green Supply Chain Continuous Improvement (GSCCI)

Model 10 is associated with the five hypotheses namely H_6, H_{12}, H_{18}, H_{24} and H_{30} wherein the dependent construct is GSCCI (Green Supply Chain Continuous Improvement) and the independent sub-constructs are EC, PP, RL, LCA and DFE. Model 10 is depicted in figure 11.

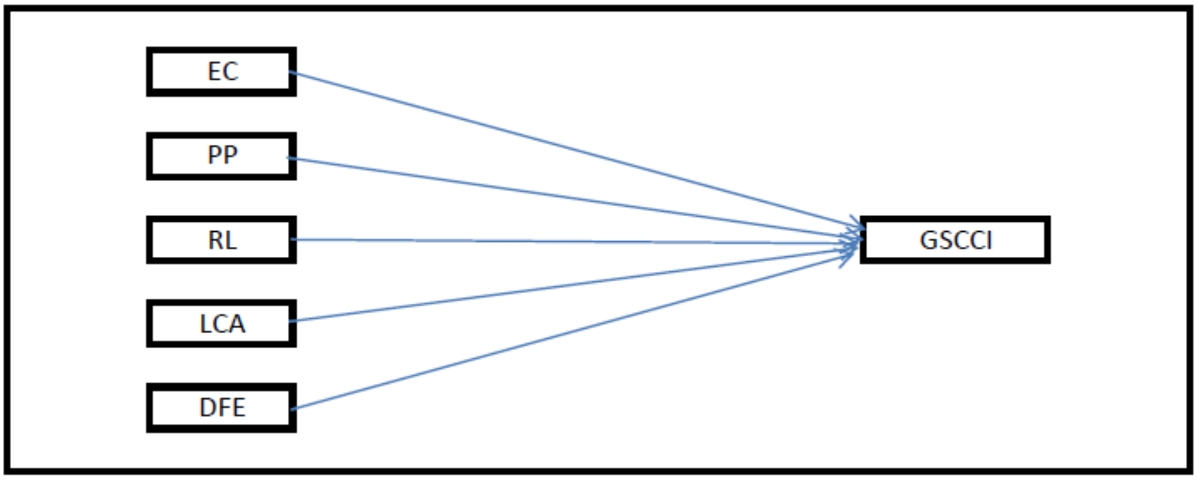

Figure 11. Model 10-Impact of GSC Practices on GSCCI

The summary of the multiple regression output for model 10 is as follows:
When the five independent or predictor constructs namely EC, PP, RL, LCA and DFE are jointly regressed against the dependent or criterion construct GSCCI, which is interval scaled, the five individual correlations collapse into what is called as a multiple r or multiple correlation. The square of the multiple r which is also commonly known as R-square or R^2 is indicative of the amount of variance in the dependent construct explained jointly by the predictors. In the case of model 10, the R^2 = 0.9290 which means that 92.90 % of the variance of the dependent construct is significantly explained jointly by the predictors EC, PP, RL, LCA and DFE at a significance level of $\alpha = 0.05$ ($p < 0.0001$), i.e., this does not hold true 0.0001 % of times. Table 35 shows the analysis of variance for model 10. Table 36 shows the computation of R^2 value for model 10. Table 37 shows the computation of parameter estimates for model 10. Thus, the hypotheses H_{6a}, H_{12a}, H_{18a}, H_{24a} and H_{30a} are substantiated. Since some of the parameter estimates are negative, as shown in the table 37, there appears to be an existence of multicollinearity. The effect of multicollinearity can be removed by using an advanced statistical analysis technique called as Principal Component Regression. On applying Principal Component Regression the centered and scaled data is as shown in the figure 20 and the new (revised) parameter estimates are obtained as shown in the table 21. Since all the revised

parameter estimates are now positive, the effect of multicollinearity is no more there. So these revised parameter estimates are usable. They are the standardized coefficients of the corresponding multiple regression equation for studying the impact of Green Supply Chain Practices on the GSCCI component of Green Supply Chain Performance. But what remains to be explored is the order in which the five Green Supply Chain Practices impact the GSCCI component of Green Supply Chain Performance. Sorting the revised parameter estimates shown in table 21 in the descending order of magnitude gives the descending order in which the corresponding Green Supply Chain Practices impact the GSCCI component of Green Supply Chain Performance. The Green Supply Chain Practices in the descending order in which they influence the GSCCI component of GSC performance is as follows: LCA, EC, PP, DFE, RL. The corresponding parameter estimates or standardized coefficients in that order are as follows: 0.1731767, 0.1531823, 0.1458501, 0.110143 and 0.0964353. Accordingly, model 1 yields the following regression equation to explain the impact of the five Green Supply Chain Practices on the GSCCI component of Green Supply Chain Performance:

GSCCI = 1.676963178 + (0.153182267)(EC) + (0.145850056) (PP) + (0.096435255) (RL) + (0.173176747) (LCA) + (0.110142968) (DFE)

Table 35. ANOVA for model 10: Dependent variable: GSCCI

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	14.01715	2.80343	253.82	<.0001
Error	97	1.07135	0.01104		
Corrected Total	102	15.08850			

Table 36. Computation of R^2 for model 10

Root MSE	0.10509	R-Square	0.9290
Dependent Mean	4.69462	Adj R-Sq	0.9253
Coeff Var	2.23862		

Table 37. Parameter estimates for model 10

Parameter Estimates						
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|	Variance Inflation
Intercept	1	0.84773	0.16089	5.27	<.0001	0
EC	1	0.26804	0.06892	3.89	0.0002	12.30377
PP	1	-0.19873	0.08756	-2.27	0.0254	28.90365
RL	1	-0.11098	0.03655	-3.04	0.0031	6.50446
LCA	1	0.83509	0.08085	10.33	<.0001	16.61923
DFE	1	0.00637	0.03221	0.20	0.8436	4.55562

PRINCIPAL COMPONENT REGRESSION

Table 38 shows the details of Principal Component Regression which was performed. There were ten response variables and five predictor variables. Missing value was not needed and one factor was extracted. A total of 103 responses were obtained during the survey for the analysis.

Table 38. Details of Principal Component Regression

Item head	Description
Factor Extraction Method	Principle Components Regression
Number of Response Variables	10
Number of Predictor Parameters	5
Missing Value Handling	Exclude
Number of Factors	1
Number of Observations Read	103
Number of Observations Used	103

Table 39 shows that the principal components collectively account for 72.5010 % of variation of the five dependent variables.

Table 39. Percentage of variation accounted for by the Principal Components

Percent Variation Accounted for by Principal Components				
Number of Extracted Factors	Model Effects		Dependent Variables	
	Current	Total	Current	Total
1	74.7760	74.7760	72.5010	72.5010

Table 40 shows the parameter estimates for the centered and scaled data pertaining to the GSC practices and GSC performance. Then the new (revised) parameter estimates are calculated.

Table 40. Parameter estimates for centered and scaled data

Parameter Estimates for Centered and Scaled Data										
	GSCPLAN	GSCPROC	GSCEXPROD	GSCEXLOG	GSCEXPACK	GSCEXMARK	GSCEXSL	CM	GSCMIG	GSCCI
Intercept	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000	0.0000000000
EC	0.2120412822	0.2178134646	0.2134287272	0.1865162919	0.2062362479	0.1584998144	0.1660297611	0.1650791419	0.1832041224	0.2109404337
PP	0.2435584032	0.2501885437	0.2451520734	0.2142394620	0.2368905275	0.1820587071	0.1907078804	0.1896159643	0.2104349825	0.2422939281
RL	0.1830151239	0.1879971569	0.1842126426	0.1609842287	0.1780047359	0.1368029040	0.1433020824	0.1424815927	0.1581254594	0.1820649696
LCA	0.2374967577	0.2439618883	0.2390507649	0.2089075020	0.2309948312	0.1775276570	0.1859615709	0.1848968303	0.2051977078	0.2362637527
DFE	0.1984717048	0.2038744964	0.1997703602	0.1745801857	0.1930381635	0.1483566221	0.1554046900	0.1545149057	0.1714799784	0.1974413050

The new (revised) parameter estimates are shown in the table 41 along with the intercept values. These new parameter estimates reveal that there is no effect of multicollinearity existing now. Hence these coefficients are dependable for building the ten regression equations.

Table 41. New (revised) parameter estimates

New Parameter Estimates										
	GSCPLAN	GSCPROC	GSCEXPROD	GSCEXLOG	GSCEXPACK	GSCEXMARK	GSCEXSL	CM	GSCMIG	GSCCI
Intercept	-1.733112398	-1.887141383	0.217714868	1.344753781	1.630605607	-1.942924586	2.312194848	-0.488033297	1.580545635	1.676963178
EC	0.311427967	0.320572971	0.221777918	0.153636718	0.159948591	0.309560444	0.104404210	0.218528332	0.153470848	0.153182267
PP	0.296521179	0.305228448	0.211162313	0.146282754	0.152292503	0.294743046	0.099406806	0.208068271	0.146124824	0.145850056
RL	0.196058173	0.201815371	0.139619360	0.096721352	0.100694966	0.194882481	0.065727233	0.137573596	0.096616930	0.096435255
LCA	0.352077842	0.362416519	0.250726008	0.173690515	0.180826261	0.349966556	0.118031818	0.247052261	0.173502995	0.173176747
DFE	0.223926708	0.230502259	0.159465444	0.110469733	0.115008172	0.222583898	0.075069979	0.157128887	0.110350467	0.110142968

Accordingly, the regression equations for predicting the ten component measures of GSC performance using the five component measures of GSC practices are as follows:

1. GSCPLAN = -1.733112398 + (0.311427967) (EC) + (0.296521179) (PP) + (0.196058173) (RL) + (0.352077842) (LCA) + (0.223926708) (DFE)
2. GSCPROC = -1.887141383 + (0.320572971) (EC) + (0.305228448) (PP) + (0.201815371) (RL) + (0.362416519) (LCA) + (0.230502259) (DFE)
3. GSCEXPROD = 0.217714868 + (0.221777918) (EC) + (0.211162313) (PP) + (0.139619360) (RL) + (0.250726008) (LCA) + (0.159465444) (DFE)
4. GSCEXLOG = 1.344753781 + (0.153636718) (EC) + (0.146282754) (PP) + (0.096721352) (RL) + (0.173690515) (LCA) + (0.110469733) (DFE)
5. GSCEXPACK = 1.630605607 + (0.159948591) (EC) + (0.152292503) (PP) + (0.100694966) (RL) + (0.180826261) (LCA) + (0.115008172) (DFE)
6. GSCEXMARK = -1.942924586 + (0.309560444) (EC) + (0.294743046) (PP) + (0.194882481) (RL) + (0.349966556) (LCA) + (0.222583898) (DFE)
7. GSCEXSL = 2.312194848 + (0.104404210) (EC) + (0.099406806) (PP) + (0.065727233) (RL) + (0.118031818) (LCA) + (0.075069979) (DFE)
8. CM = -0.488033297 + (0.218528332) (EC) + (0.208068271) (PP) + (0.137573596) (RL) + (0.247052261) (LCA) + (0.157128887) (DFE)
9. GSCMIG = 1.580545635 + (0.153470848) (EC) + (0.146124824) (PP) + (0.096616930) (RL) + (0.173502995) (LCA) + (0.110350467) (DFE)
10. GSCCI = 1.676963178 + (0.153182267) (EC) + (0.145850056) (PP) + (0.096435255) (RL) + (0.173176747) (LCA) + (0.110142968) (DFE)

Table 42. Summary of the ten regression models

Model	Hypotheses addressed	Dependent Construct	Independent Constructs	R^2	p-value for significance level of α=0.05	Ref. table for ANOVA, R^2, New parameter estimates.	Order of influence of GSC Practices on individual GSC Performance measure
1	H_1, H_7, H_{13}, H_{19}, H_{25}.	GSCPLAN	EC, PP, RL, LCA, DFE.	0.9606	$p < 0.0001$	8, 9, 10.	LCA, EC, PP, DFE, RL.
2	H_2, H_8, H_{14}, H_{20}, H_{26}.	GSCPORC	EC, PP, RL, LCA, DFE.	0.9901	$p < 0.0001$	11, 12, 13.	LCA, EC, PP, DFE, RL.
3	H_{3A}, H_{9A}, H_{15A}, H_{21A}, H_{27A}	GSCEXPROD	EC, PP, RL, LCA, DFE.	0.9561	$p < 0.0001$	14, 15, 16.	LCA, EC, PP, DFE, RL.
4	H_{3B}, H_{9B}, H_{15B}, H_{21B}, H_{27B}	GSCEXLOG	EC, PP, RL, LCA, DFE.	0.9050	$p < 0.0001$	17, 18, 19.	LCA, EC, PP, DFE, RL.
5	H_{3C}, H_{9C}, H_{15C}, H_{21C}, H_{27C}	GSCEXPACK	EC, PP, RL, LCA, DFE.	0.9286	$p < 0.0001$	20, 21, 22.	LCA, EC, PP, DFE, RL.
6	H_{3D}, H_{9D}, H_{15D}, H_{21D}, H_{27D}	GSCEXMARK	EC, PP, RL, LCA, DFE.	0.9403	$p < 0.0001$	23, 24, 25.	LCA, EC, PP, DFE, RL.
7	H_{3E}, H_{9E}, H_{15E}, H_{21E}, H_{27E}	GSCEXSL	EC, PP, RL, LCA, DFE.	0.8792	$p < 0.0001$	26, 27, 28.	LCA, EC, PP, DFE, RL.
8	H_4, H_{10}, H_{16}, H_{22}, H_{28}	CM	EC, PP, RL, LCA, DFE.	0.9005	$p < 0.0001$	29, 30, 31.	LCA, EC, PP, DFE, RL.
9	H_5, H_{11}, H_{17}, H_{23}, H_{29}	GSCMIG	EC, PP, RL, LCA, DFE.	0.8908	$p < 0.0001$	32, 33, 34.	LCA, EC, PP, DFE, RL.
10	H_6, H_{12}, H_{18}, H_{24}, H_{30}	GSCCI	EC, PP, RL, LCA, DFE.	0.9290	$p < 0.0001$	35, 36, 37.	LCA, EC, PP, DFE, RL.

These ten regression equations can be used to scale the ten individual component performance measures of the construct "GSC Performance" based on the extent to which the individual components of GSC practices are used. Further, it is observed that each of the ten GSC Performance measures is influenced by the five GSC Practices in the same order. This means that there is a definite order in which GSC Practices impact GSC Performance measures.

Figure 12 shows graphically using a column chart, the influence of the five GSC Practices namely LCA, EC, PP, DFE and RL on the GSCPLAN component of GSC Performance.

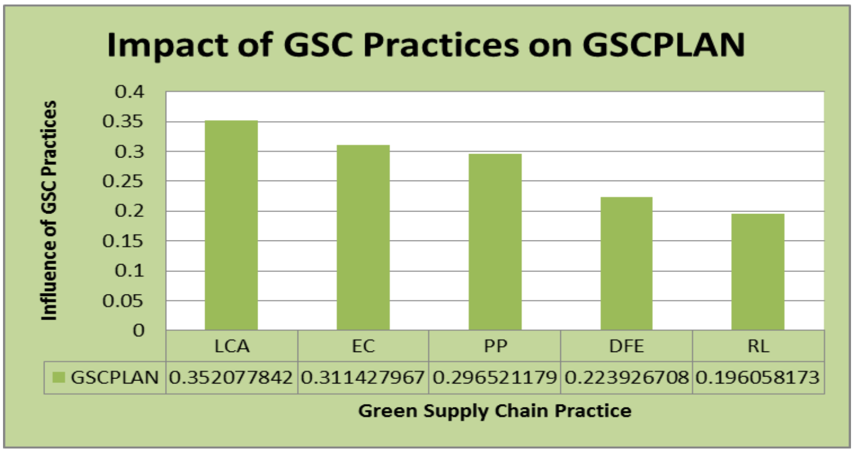

Figure 12. Order of influence of GSC Practices on GSCPLAN

Figure 13 shows graphically using a column chart, the influence of the five GSC Practices namely LCA, EC, PP, DFE and RL on the GSCPROC component of GSC Performance.

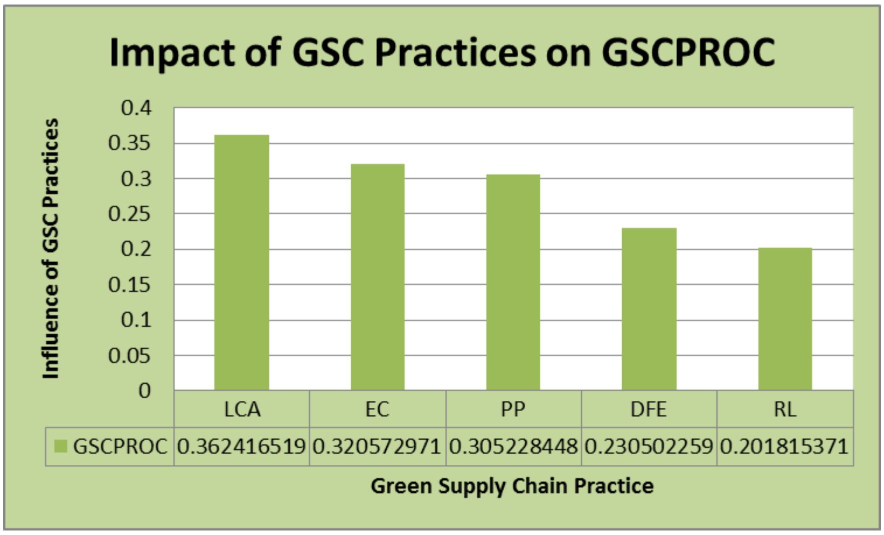

Figure 13. Order of influence of GSC Practices on GSCPROC

Figure 14 shows graphically using a column chart, the influence of the five GSC Practices namely LCA, EC, PP, DFE and RL on the GSCEXPROD component of GSC Performance.

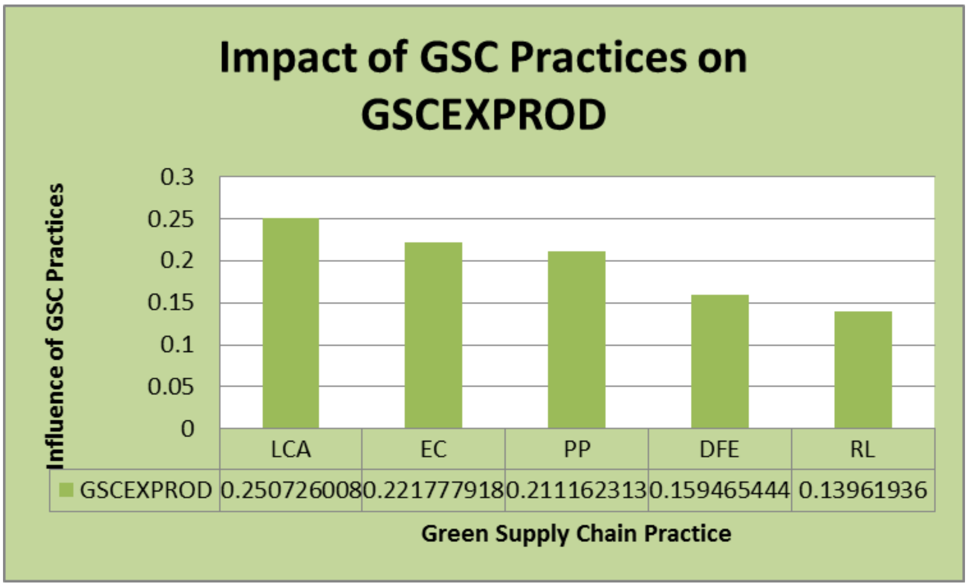

Figure 14. Order of influence of GSC Practices on GSCEXPROD

Figure 15 shows graphically using a column chart, the influence of the five GSC Practices namely LCA, EC, PP, DFE and RL on the GSCEXLOG component of GSC Performance.

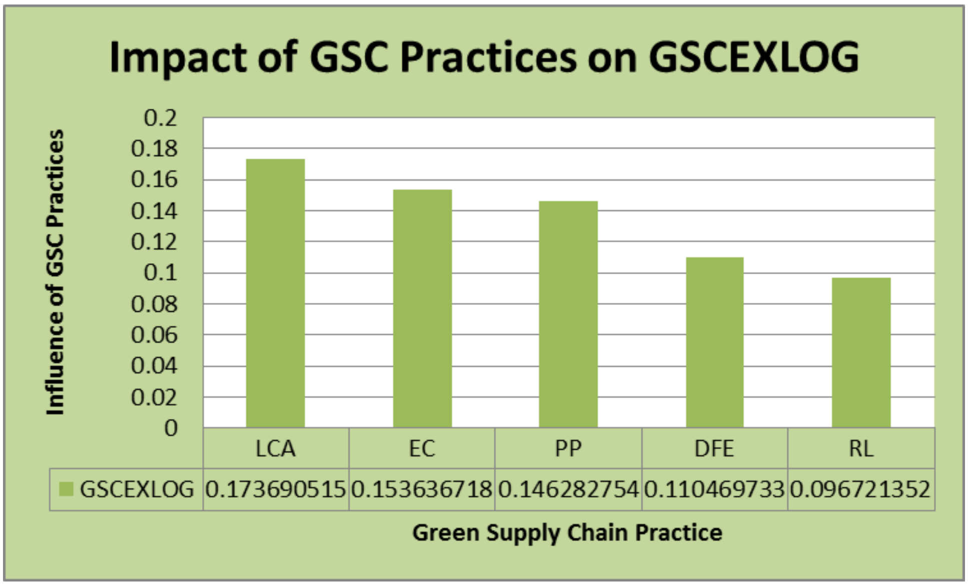

Figure 15. Order of influence of GSC Practices on GSCEXLOG

Figure 16 shows graphically using a column chart, the influence of the five GSC Practices namely LCA, EC, PP, DFE and RL on the GSCEXPACK component of GSC Performance.

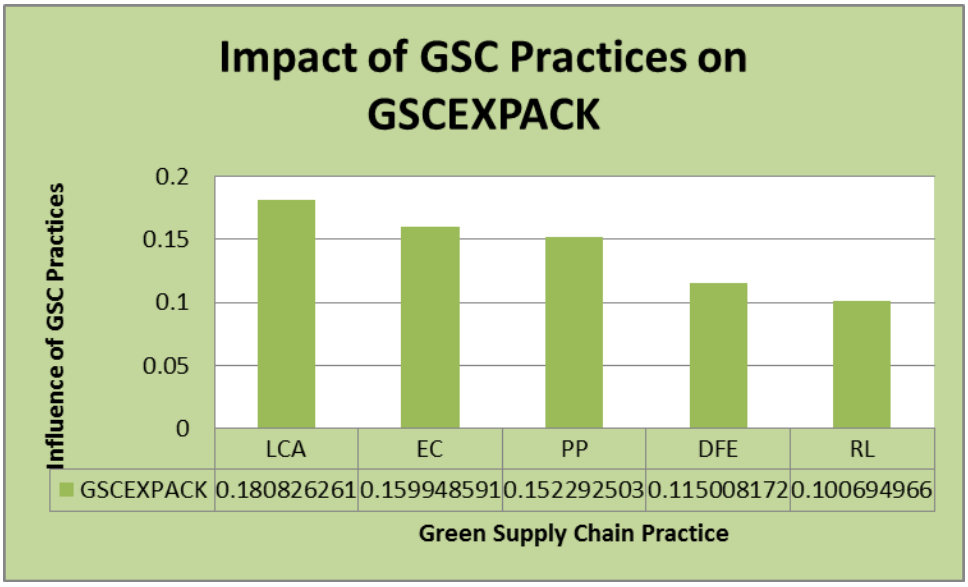

Figure 16. Order of influence of GSC Practices on GSCEXPACK

Figure 17 shows graphically using a column chart, the influence of the five GSC Practices namely LCA, EC, PP, DFE and RL on the GSCEXMARK component of GSC Performance.

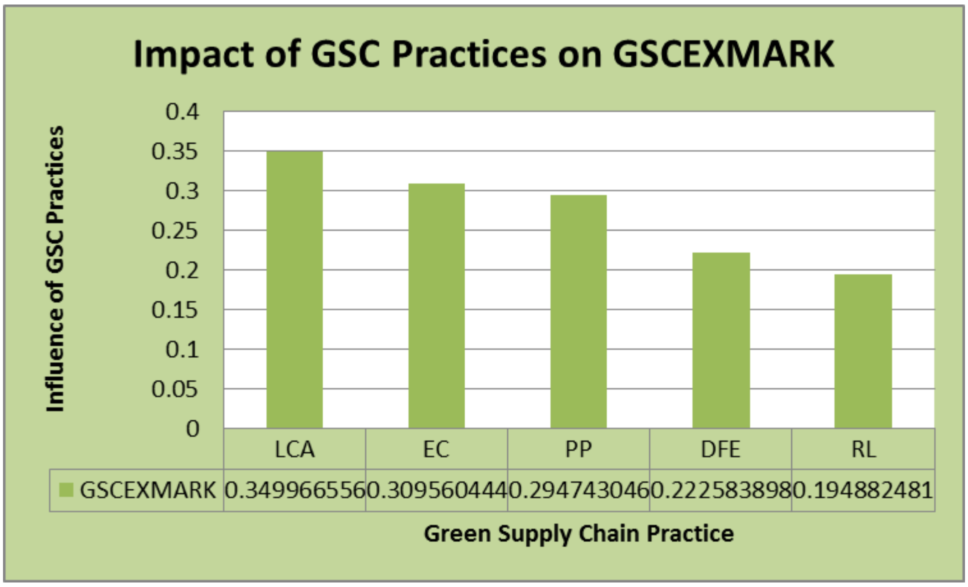

Figure 17. Order of influence of GSC Practices on GSCEXMARK

Figure 18 shows graphically using a column chart, the influence of the five GSC Practices namely LCA, EC, PP, DFE and RL on the GSCEXSL component of GSC Performance.

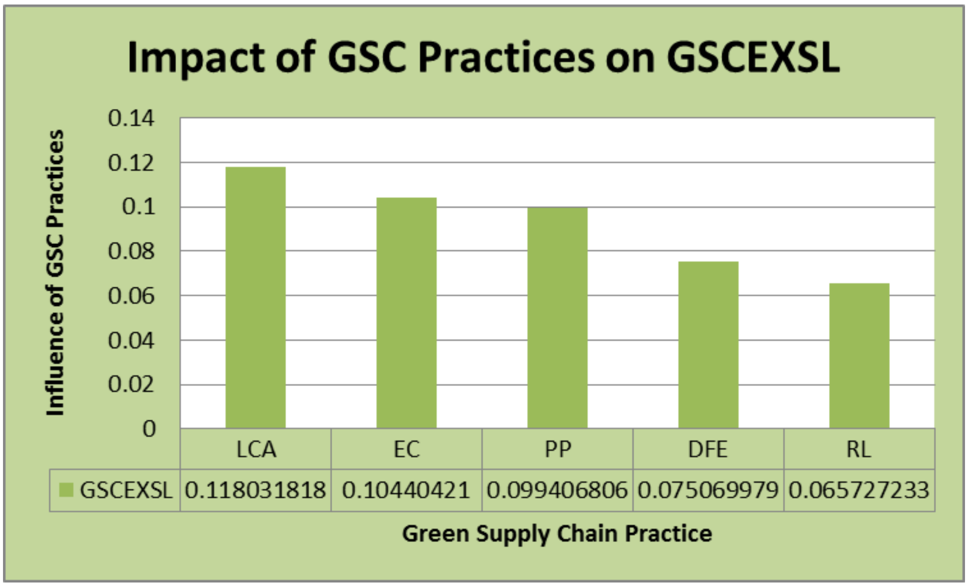

Figure 18. Order of influence of GSC Practices on GSCEXSL

Figure 19 shows graphically using a column chart, the influence of the five GSC Practices namely LCA, EC, PP, DFE and RL on the CM component of GSC Performance.

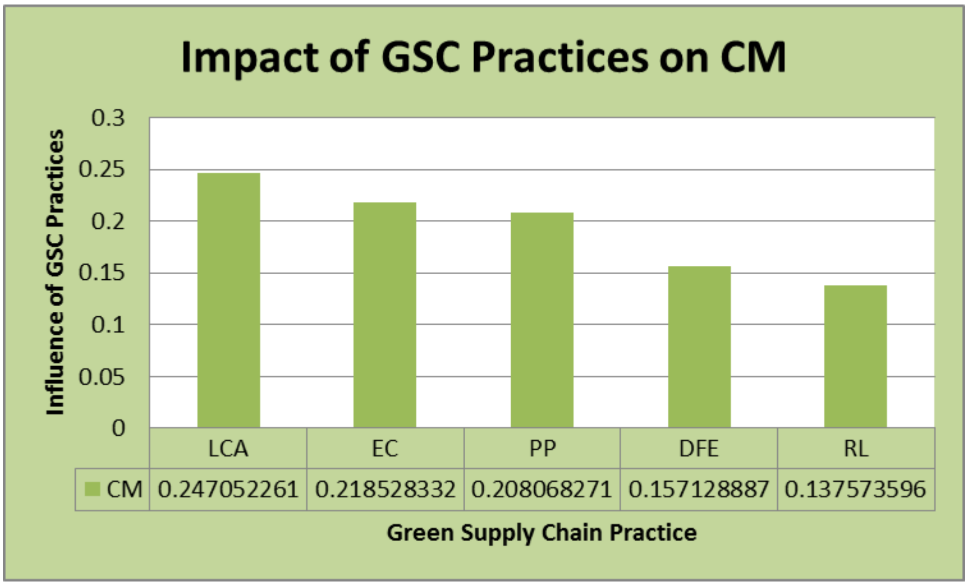

Figure 19. Order of influence of GSC Practices on CM

Figure 20 shows graphically using a column chart, the influence of the five GSC Practices namely LCA, EC, PP, DFE and RL on the GSCMIG component of GSC Performance.

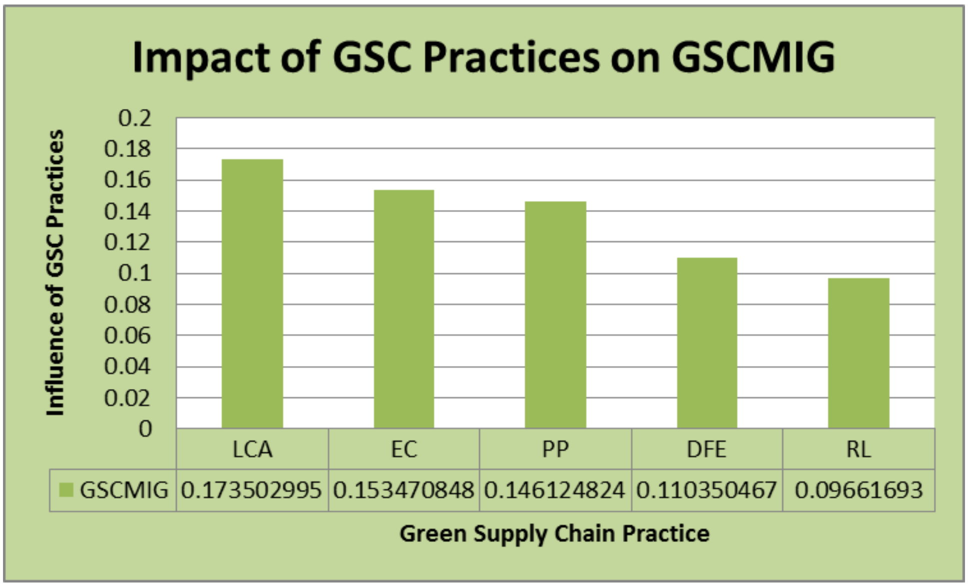

Figure 20. Order of influence of GSC Practices on GSCMIG

Figure 21 shows graphically using a column chart, the influence of the five GSC Practices namely LCA, EC, PP, DFE and RL on the GSCCI component of GSC Performance.

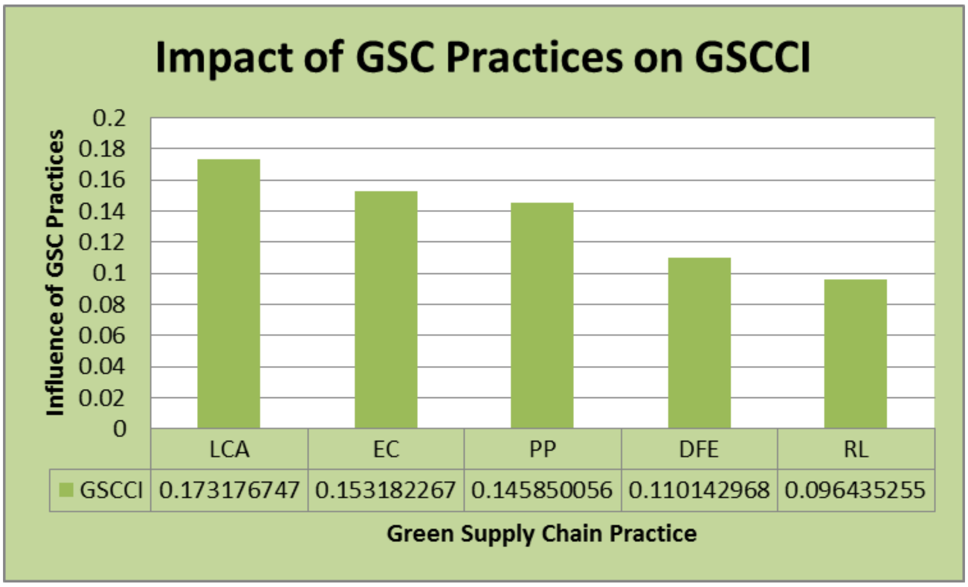

Figure 21. Order of influence of GSC Practices on GSCCI

Also the order of influence of each of the five components of GSC Practices on each of the ten components measures of GSC Performance is consistently in the descending order of influence of the GSC Practices namely LCA, EC, PP, DFE and RL. Also on the basis of communality estimates (h^2) of the components of each of the five GSC Practices and on the basis of the communality estimates of the components of each of the ten GSC Performance measures it is possible to rank the order of the variables constituting them as established in [10], [11], [12], [13], [14], [15], [16], [17], [18], [19], [20], [21], [22], [23] and [24].

CONCLUSION

From table 6 it can be said conclusively that various sub-construct components of green supply chain practices namely Environmental Certification; Pollution Prevention; Design for the Environment; Life Cycle Assessment; and Reverse Logistics are positively associated in varying degrees with various sub-construct components of green supply chain performance namely Green Supply Chain Planning; Green Supply Chain Procurement; Green Supply Chain Execution-Production; Green Supply Chain Execution-Logistics; Green Supply Chain Execution-Packaging; Green Supply Chain Execution-Marketing; Green Supply Chain Execution-Supply Loops; Carbon Management; Green Supply Chain Migration; and Green Supply Chain Continuous Improvement. Further it is evident from the regression coefficients of table 41 and fom Fig.12 through Fig. 21 that particular GSC Practices have a pre-dominance over the other ones in influencing the individual GSC Performance measures. In other words there is a definite ordering of each of the five component measures of GSC Practices in jointly influencing each of the ten individual component measures of GSC Performance. The descending order of influence of GSC practices on individual component measures of GSC performance is as follows: LCA, EC, PP, DFE and RL. The existing body of knowledge has established at a broad level that GSC Practices have an impact on GSC Performance. However, it has not been able to establish very conclusively as to which of these GSC Practices specifically impacts which of the GSC Performance measures. This study was set out to explore the unexplored linkages between GSC practices and component measures of GSC Performance. Several definitions of GSC Practices and GSC Performance emerged during a detailed literature review. But the impact of GSC Practices on GSC Performance measures using the combination of definitions of GSC practices and GSC Performance as used in this research study has not been explored before. The research study was set out to study the joint impact of five identified Green Supply Chain Practices on ten identified individual component measures of GSC Performance with reference to the Indian automobile manufacturing sector by means of an empirical study by administering a questionnaire on representatives of automobile manufacturing firms and plants.

The study could establish the fact that each of the five GSC Practices has a significant positive correlation with each of the ten individual component measures of GSC Performance which is evident from the correlation coefficients computed between each of them. This finding is in line with the findings in existing literature also. Also from this it was possible to find the order in which the five GSC Practices are correlated with each of the ten individual component measures of GSC Performance. Looking at it in the other way the study could also establish the order in which each of the ten GSC Performance measures is correlated with each of the five GSC Practices. This is a unique finding made by this study.

On doing regression analysis it was possible to establish ten regression equations each used to establish the joint impact of each of the five GSC Practices on each of the individual component measures of GSC Performance. In short since there are ten measures of GSC Performance, ten multiple linear regression equations were obtained. Each regression equation helps to establish a particular GSC Performance measure.

These ten linear multiple regression equations can be used to predict the individual GSC Performance measures.

A closer look at the coefficients of these ten linear multiple regression equations revealed these coefficients or the parameter estimates follow a particular pattern. In each of the ten multiple regression equations it was observed that the parameter estimates had a particular hierarchy. The parameter estimates were consistently highest for LCA followed by EC followed by PP followed by DFE followed by RL. This means that whenever the five GSC Practices jointly impact GSC Performance measures, they do so in a particular order. And this order is consistent when applied to each of the ten GSC Performance measures. So it can be conclusively stated that there is a definite order in which each of the five GSC Practices will jointly impact each of the ten individual component measures of GSC Performance. This is a finding which has not been established by existing research. This is one of the key findings of this research work.

Accordingly, in line with the above discussion, in all ten models or multiple linear regression equations were obtained. The goodness of a model is measured by its R^2 value. The R^2 value is a measure of the amount of variance in the dependent construct explained jointly by the predictors or independent constructs. In the case of this research the dependent constructs are the ten individual GSC Performance measures and the predictors or the independent constructs are the five GSC Practices. By ranking the R^2 values of the ten multiple regression equations it is possible to know which model (GSC Performance measure) is able to explain the joint variation of the five GSC Practices the most and also which model or (GSC Performance measure) is able to explain the joint variation of the five GSC Practices the least. Accordingly, we can get the ordering of GSC Performance measures as regards their ability to explain the joint variation of the five GSC Practices. This order is as follows: GSCPROC with a R^2 value of 0.9901; followed by GSCPLAN with a R^2 value of 0.9606; followed by GSCEXPROD with a R^2 value of 0.9561; followed by GSCEXMARK with a R^2 value of 0.9403; followed by GSCCI with a R^2 value of 0.9290; followed by GSCEXPACK with a R^2 value of 0.9286; followed by GSCEXLOG with a R^2 value of 0.9050; followed by CM with a R^2 value of 0.9005; followed by GSCMIG with a R^2 value of 0.8908; followed by GSCEXSL with a R^2 value of 0.8792.

This finding is a bye product of this research, but it has interesting insights. Practitioners can make use of this ordering of GSC Performance measures based on R^2 to focus on improving a particular component measure of GSC Performance. It is important to know this ordering as it helps in prioritizing the GSC Performance improvement projects to be taken up first. Prioritizing is needed because most of the projects have financial implications associated with them.

The findings of this research also add to the existing body of knowledge as these are unique findings.

Based on the value of communality estimates (h2) of the variables constituting each construct it is possible to conclude about how much of each variable is accounted for by underlying factors taken together. Accordingly it is possible to arrive at the order of contribution of the variables constituting each of the sub-constructs of GSC Practices and GSC Performance.

Using this logic -

1. The five component variables of the construct EC (total h2 = 3.824) contribute in the following descending order: EC4 (0.975), EC5 (0.975), EC2 (0.974), EC3 (0.888), EC1 (0.011).
2. The eleven component variables of the construct PP (total h2 = 9.287) contribute in the following descending order: PP2 (0.963), PP9 (0.962), PP4 (0.962), PP11 (0.962), PP3 (0.868), PP10 (0.865), PP8 (0.774), PP5 (0.765), PP1 (0.736), PP6 (0.734), PP7 (0.691).
3. The fifteen component variables of the construct RL (total h2 = 13.725) contribute in the following descending order: RL13 (0.992), RL14 (0.992), RL4 (0.973), RL11 (0.973),

RL13 (0.973), RL9 (0.961), RL7 (0.954), RL6 (0.938), RL15 (0.930), RL2 (0.98), RL12 (0.855), RL5 (0.843), RL10 (0.821), RL1 (0.811), RL8 (0.786).

4. The eight component variables of the construct DFE (total h2 = 7.219) contribute in the following descending order: DFE6 (0.987), DFE5 (0.966), DFE2 (0.944), DFE4 (0.928), DFE3 (0.917), DFE8 (0.878), DFE1 (0.801), DFE7 (0.794).
5. The three component variables of the construct LCA (total h2 = 1.867) contribute in the following descending order: LCA3 (0.884), LCA2 (0.844), LCA1 (0.139).
6. The five component variables of the construct GSCPLAN (total h2 = 4.223) contribute in the following descending order: GSCPLAN1 (0.915), GSCPLAN3 (0.915), GSCPLAN2 (0.885), GSCPLAN4 (0.808), GSCPLAN5 (0.698).
7. The eleven component variables of the construct GSCPROC (total h2 = 10.606) contribute in the following descending order: GSCPROC8 (0.997), GSCPROC4 (0.991), GSCPROC1 (0.986), GSCPROC7 (0.983), GSCPROC10 (0.983), GSCPROC5 (0.981), GSCPROC2 (0.980), GSCPROC9 (0.980), GSCPROC6 (0.975), GSCPROC3 (0.899), GSCPROC11 (0.846).
8. The seven component variables of the construct GSCEXPROD (total h2 = 5.68) contribute in the following descending order: GSCEXPROD5 (0.920), GSCEXPROD2 (0.893), GSCEXPROD7 (0.879), GSCEXPROD6 (0.850), GSCEXPROD4 (0.838), GSCEXPROD3 (0.809), GSCEXPROD1 (0.488).
9. The twelve component variables of the construct GSCEXLOG (total h2 = 9.884) contribute in the following descending order: GSCEXLOG1 (0.953), GSCEXLOG5 (0.907), GSCEXLOG12 (0.905), GSCEXLOG3 (0.895), GSCEXLOG11 (0.894), GSCEXLOG7 (0.859), GSCEXLOG6 (0.839), GSCEXLOG10 (0.836), GSCEXLOG4 (0.808), GSCEXLOG2 (0.729), GSCEXLOG9 (0.685), GSCEXLOG8 (0.570).
10. The four component variables of the construct GSCEXPACK (total h2 = 3.975) contribute in the following descending order: GSCEXPACK1 (0.998), GSCEXPACK2 (0.998), GSCEXPACK4 (0.998), GSCEXPACK3 (0.981).
11. The four component variables of the construct GSCEXMARK (total h2 = 3.663) contribute in the following descending order: GSCEXMARK3 (0.982), GSCEXMARK4 (0.982), GSCEXMARK1 (0.892), GSCEXMARK2 (0.807).
12. The three component variables of the construct GSCEXSL (total h2 = 1.82) contribute in the following descending order: GSCEXSL3 (0.897), GSCEXSL1 (0.703), GSCEXSL2 (0.220).
13. The seven component variables of the construct CM (total h2 = 5.231) contribute in the following descending order: CM1 (0.935), CM4 (0.883), CM5 (0.883), CM7 (0.83), CM2 (0.770), CM3 (0.528), CM6 (0.445).
14. The five component variables of the construct GSCMIG (total h2 = 4.629) contribute in the following descending order: GSCMIG4 (0.963), GSCMIG1 (0.956), GSCMIG2 (0.943), GSCMIG3 (0.913), GSCMIG5 (0.852).
15. The eleven component variables of the construct GSCCI (total h2 = 9.956) contribute in the following descending order: GSCCI5 (0.968), GSCCI1 (0.964), GSCCI6 (0.964), GSCCI4 (0.911), GSCCI8 (0.908), GSCCI9 (0.908), GSCCI11 (0.908), GSCCI10 (0.907), GSCCI3 (0.879), GSCCI7 (0.827), GSCCI2 (0.805).

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