

International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)

International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal

Volume 3, Issue 4, June 2023

GSCM Practices and Organizational Performance: An Empirical Investigation of Indian Manufacturing Industry

Yogesh Khode, Amol Bhamare, Kanchan Ugale R. H. Sapat College of Engineering Management Studies and & Research, Nashik, India

Abstract: This paper is focused on finding the influence of GSCM practices on organization's performance in context to Indian manufacturing industries. With the selected GSCM practices, this paper developed a theoretical framework related to GSCM practices and Organizational. Performance (i.e., environmental performance, financial performance, customer satisfaction and operational performance) and empirically test the developed framework, to study the influence of these GSCM practices on Organizational Performance for Indian Manufacturing Industries.

Keywords: GSCM, GSCM Practices, SCM, SEM, Performance.

I. INTRODUCTION

Drastic change in the present days manufacturing organizations has made mandatory to all industrial practitioners to reduce losses of the natural resources as much extent as possible. There is significant damage to natural resources and the environment due to increased societal demand for the production of industrial goods, and their related activities, energy and resource consumption. The environmental issues arose from different phases of the production cycle caused limitation to the natural resources which finally made burden to the society. All these issues have provoked the people from different sectors of society and made them compulsory to practice the Green Supply Chain Management (GSCM) practices which helps not only in reducing the negative impact on environment but also increases the business performance of the organizations. GSCM practices helps in the improvement of financial, operational, environmental performance of organization. Therefore, to survive in the today's competitive global market, manufacturing organizations need to take environmental issues in to consideration.

This paper is focused on finding the influence of GSCM practices on organization's performance in context to Indian manufacturing industries. As there are many GSCM practices in manufacturing industries they will be found by the extensive review of the literature available. The framework will be developed and relationship amongst these GSCM practices and Organization performance measures namely environmental performance, operational performance, financial performance and customer satisfaction will be determined and they will be categorized as highly supported, medium supported and less supported hypotheses.

Finally, three GSCM practices have been selected with the advocacy of academia, industry experts and literature namely, Green Design, Green Manufacturing and Reverse Logistics. The selected GSCM practices have maximum impact on organizational performance.

With the selected GSCM practices, this paper is directed to develop a theoretical framework related to GSCM practices and Organizational Performance (i.e., environmental performance, financial performance, customer satisfaction and operational performance) and empirically test the developed frame work, to study the influence of these GSCM practices on Organizational Performance for Indian Manufacturing Industries. For the purpose of this a pursuit of the literature has been directed to identify different GSCM practices and performance outcomes. The search has been completed in English language and utilized the accompanying electronic data base which excludes paper related to Social Science, Economics, Econometrics, Finance, Environment Science, Mathematics, Energy and Medicine. The extensive literature review has been carried out till 2018 related to GSCM from Scopus database.

Copyright to IJARSCT www.ijarsct.co.in





International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)

International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal

Volume 3, Issue 4, June 2023

A questionnaire was developed as a part of survey and data was collected from respondents of manufacturing organizations. The developed framework was tested and structural equation modeling was used to test the hypothesized relationships.

II. LITERATURE REVIEW

The extensive literatures were carried out till 2018 related to GSCM practices and its performance outcomes. Out of them few papers were selected which are exactly related to present work. Li and Huang (2017) attempted to recognize social relationship as a potential mediator and inspect the connections between GSCM practices, social holding and green advancement performance. Exploratory factor analysis of GSCM practices, social holding and green advancement performance were performed. Confirmatory factor analysis for the measurement model was also done. To test the hypothesis, regression analysis was performed. The outcomes have shown that GSCM practices are positively related to the organization's green advancement performance. Balasubramanian and Shukla (2017) aimed to validate a GSCM framework that was developed for a construction sector. With the help of an extensive literature review a framework consisting of nine constructs and their factors was developed.

It was validated by using the data that was collected through a standard questionnaire. The outcomes confirm the reliability and validity of the constructs and their factors. Younis et al. (2016) tried to scrutinize the execution of GSCM practices and its effect on organizational performance. Practices namely green design, reverse logistics and green procurement, and performances namely environmental, operational, social and financial performances were considered. With the help of survey questionnaires statistical analysis was done. To test the hypotheses multiple regression analysis was done. Outcomes of their analysis have shown that environmental performance was not being affected by any of the practices and operational performance was majorly affected by green procurement. Tseng et al. (2016) studied the effect of GSCM practices on organizations competitiveness. Different types of practices like green manufacturing, green procurement and investment recovery were considered. Analysis was done using the partial least squares package. Results have revealed that organizations competitiveness is directly affected by both the practices.

Luthra et al. (2014) attempted to recognize and empirically analyze GSCM practices in context to Indian automobile industry. After thorough literature review six practices and four performances have been found. A standard questionnaire was prepared and survey has done. Multiple regression analysis was performed to know the effect of practices on performance outcomes. Outcomes of the analysis have shown that with the implementation of GSCM practices there will be improvement in Financial, environmental, operational and social performance of automobile industries. Mitra and Datta (2014) have done survey on GSCM practices that can be implemented in manufacturing organizations of India. They have foundthat the level of implementation of practices is at very low level. Outcomes of their data analysis have shown that supplier cooperation for environmental sustainability had a strong impact on reverse logistics and green design. Also, they have shown that GSCM practices have positively influenced the financial performance of the organizations.

Mohanty and Anand (2014) applied SEM to illustrate the influence of GSCM practices on Micro Small Medium Enterprises (MSME) in India. Their study confirmed and validated that the internal and external pressures are building due to the lack of implementation of GSCM practices in MSME. Sharma M (2014) aimed to investigate GSCM practices that are being implemented in the automobile industries in India. Some of the practices are environmental management systems, green procurement, eco design, green production etc. A questionnaire consisting of 21 questions was developed and survey was done to test the hypothesis. Hierarchical regression analysis has been used for analysis. Outcomes of the study have shown that a large number of employers engagement helps in building sound GSCM practices.

Through the analysis of literature, this has been observed that there exists a direct relationship between the adoptions of GSCM practices by an organization and its performance. Also, it has been observed that many authors have figured out only three out of four performance outcomes i.e., operational, customer satisfaction, economic and environmental. But for the current research work all the four performance outcomes were taken in to consideration.

Copyright to IJARSCT www.ijarsct.co.in





www.ijarsct.co.in

International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)

International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal

Volume 3, Issue 4, June 2023

III. THEORETICAL FRAMEWORK AND HYPOTHESIS DEVELOPMENT

To study the effects of GSCM practices, it is required to have a framework which the predictions can make and tested. This conceptual framework developed helps in drawing out hypothesis about the GSCM practices that affects the performance of an organizational viz. operational performance, financial performance and customer satisfaction.

From the literature, three GSCM practices are tabled to investigate the effects on the organizational performance. The GSCM practices selected are Green Design (GD), Green Manufacturing (GM) and Reverse Logistics (RL).

Taking all three practices in consideration a framework is developed to which describes the casual relationship between the GSCM practices and its effects on operational performance, customer satisfaction, environmental performance and financial performance.

The figure 1 shows the theoretical model relating the above mentioned twelve hypotheses. The model shows the direct and positive affair between the GSCM practices and organizational performance.



Fig 1 Theoretical Model for Model Testing

Table 1: Definitions of Constructs

Construct	Definitions					
Green Design(GD)	Green design is environmental conscious design for total life cycle process. It deals with design for waste minimization.					
Green Manufacturing(GM)	Green Manufacturing is comprised of product design and processes which results in products where the environmental effects are negligible					
Reverse Logistics(RL)	Reverse logistics is used to recover the used products and materials					
Copyright to IJARSCT	DOI: 10.48175/IJARSCT-11570 4					

2581-9429 **JARSCT**



International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)

International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal

Operational Performance(OP)	Operational performance is measured against standards or prescribed indicators of effectiveness, efficiency, and environmental responsibility such as, cycle time, productivity and waste reduction						
Financial Performance(FP)	Financial performance outcome can be measured by the results of an organization's policies and operations in monetary terms						
EnvironmentalPerformance (EP)	Environmental performance outcomes are the consequences of GSCM practices on the natural environment of the organization						
Customer Satisfaction(CS)	Customer satisfaction is a measure of how the products or services that are supplied by an organization match up against the customer's expectations of that product or service						

IV. LARGE-SCALE DATA COLLECTION

After the questionnaire was prepared, it was sent to the manufacturing industries located at different parts of India from online mode as well as offline mode. As this survey was all about GSCM practices therefore target department in the manufacturing sector was production/distribution/sales/ corporate executive and managers as these personals were deemed to have best knowledge in the GSCM area. The target industries were electrical and electronics, pharmaceuticals, fast moving consumer goods and automobile industries.

The survey was confined to India only and was conducted during January 2018 to April 2018 (4 months). The list of companies was collected from Wikipedia and various websites. The survey was conducted in two modes i.e.,offline and online mode. A total of 80 printed questionnaires were distributed to various manufacturing industries, out of which 5 completed questionnaire were received back. The survey was conducted online through the questionnaire being prepared on 'Google Forms' and was mailed to around 250 companies across country. A total of 133 responses were received back. In total 138 responses were collected through offline and online mode of data collection.

V. LARGE- SCALE INSTRUMENT ASSESSMENT METHODOLOGY

For instrument estimation, CFA is done using AMOS software for measurement models, which is then followed by the structural model displaying the hypothesized relationships. In this study 138 (sample size) responses have been collected from Indian Manufacturing industries situated all across nation. A two-step approach SEM is used in this analysis. Measurement model was tested first, validated and then the assessment of structural model was done as proposed by Gerbing and Anderson (1988). This is better when compared to the single step approach where both (measurement and structural) the models are analyzed simultaneously. A required level of measurement fit (better fit) for the structural model is achieved with two step approach (Anderson and Gerbing, 1998).

The model fit in the CFA to be reliable, valid tests is to be carried out. The three most popular tests are content validity, construct validity (convergent and discriminant validity) and reliability (Internal consistency). First the content validity is performed followed by reliability or internal consistency. Then convergent validity is executed using AMOS software for SEM. At last discriminant validity is checked. Discriminant validity is performed after convergent validity and reliability test, because the differences in the construct are checked only for valid and reliable constructs.

5.1 Confirmatory Factor Analysis

Instrument assessment is an important step in testing the research model. Confirmatory factor analysis (CFA) using AMOS software was performed for all the individual constructs. The entire path estimates for all the constructs were found more than 0.5 and shows sufficient convergent validity. The variance extracted (VE) for entire construct was found above 0.5. Similarly, the reliability of the construct is measured in the form of construct reliability (CR). The CR for all the constructs were found above 0.75 and is well above the acceptable range (acceptable range for VE is 0.5 and CR is 0.7) (Hair Jr et al., 2010). Again, each construct was tested using multiple fit indices, namely, χ 2 statistics, goodness of fit index (GFI), comparative fit index (CFI) and root mean square error of approximation (RMSEA), and all are found well within the range. Overall, entire constructs having sufficient convergent validity and reliability. The results of CFA are shown in table 2.

Copyright to IJARSCT www.ijarsct.co.in





International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)

International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal

Volume 3, Issue 4, June 2023

Table 2 Confirmatory Factor Analysis

Constructs	Variables	Path Estimate	Variance Extracted	Construct Reliability	
GD	GD1	0.712			
	GD2	0.675	0.522	0.813	
	GD3	0.717	0.322	0.815	
	GD4	0.784			
	GM1	0.68			
GM	GM2	0.721			
	GM3	0.68	0.510	0.839	
	GM4	0.74			
	GM5	0.75			
	RL1	0.731			
	RL2	0.721			
DI	RL3	0.778	0.514	0.863	
KL	RL4	0.62	0.314	0.805	
	RL5	0.687			
	RL6	0.756			
	OP2	0.798			
	OP3	0.649			
OP	OP4	0.645	0.507	0.859	
01	OP5	0.694	0.307	0.007	
	OP6	0.786			
	OP7	0.686			
	FP1	0.738			
	FP2	0.75		0.854	
FP	FP4	0.752	0.540		
	FP5	0.694			
	FP6	0.74			
	EP1	0.725			
	EP2	0.748		0.842	
EP	EP3	0.685	0.516		
	EP4	0.72	_		
	EP6	0.715			
	CS1	0.721			
	CS2	0.754		0.879	
CS	CS3	0.72			
	CS4	0.693	0.511		
	CS5	0.67			
	CS6	0.696			
	CS7	0.75			

CMIN/DF= 4.25; GFI= 0.90; CFI= 0.92; RMSEA= 0.09

5.2 Discriminant Validity

Discriminant validity shows that how much a construct is recognizable from each other. High values of discriminant validity cater confirmation that a construct is unique and captures some aspects that others measures do not.

The CFA model with all the constructs correlated with each other was assessed in AMOS for exogenous variables, using refined individual constructs. This was done to assess the discriminant validity. The model was run to find out the correlation matrix among all individual constructs. From the AMOS results, the discriminant validity obtained by comparing the variance extracted (VE) for any two constructs with the square of the correlation estimates between these two constructs. The VE should be greater than the squared correlation estimate. Passing this estimate provides good evidence of discriminant validity.

Copyright to IJARSCT www.ijarsct.co.in







International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)

International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal

IJARSCT

Volume 3, Issue 4, June 2023

			-		-		
	GD	GM	RL	OP	FP	EP	CS
GD	0.52						
GM	0.50	0.51					
RL	0.40	0.23	0.51				
OP	0.51	0.49	0.27	0.54			
FP	0.03	0.07	0.13	0.42	0.52		
EP	0.45	0.46	0.37	0.41	0.33	0.51	
CS	0.40	0.45	0.40	0.53	0.38	0.42	0.51

Table 3 Discriminant Analysis

All variance extracted (VE) estimates in the table 3 are larger than the corresponding squared constructs correlation estimates. This mean the indicators have more in common with the construct they are associated with than they do with other constructs. Therefore, present model demonstrates high discriminant validity.

VI. STRUCTURAL MODEL TESTING RESULTS

From the AMOS structural model analysis, the results obtained are presented in table 4. Out of 12 hypotheses 10 were found to be significantly supported. Hypotheses H1a, H1c and H3b were significant at the 0.05 level, Hypotheses H1b, H2b, H3c and H3d were significant at the 0.01 level while Hypotheses H2a, H2c and H2d were significant at the 0.001 level. The regression weights for Hypothesis H1d and H3a were found 0.22 and 0.21 which were not significant. Therefore, all research hypotheses except H1d and H3a are supported by the AMOS structural modelling results. Out of 10 supported relationships, 5 relationships had a large effect size and the remaining 5 had a medium effect size. Thus the effect size results confirm that the supported relationships have both theoretical and managerial applications. The model fit measures are CMIN/DF= 4.25, GFI= 0.90, CFI=0.92, RMSEA= 0.09. All the fit indices are found well within recommended limits.

Hypotheses	Relationship	Regression	Effect Size	Р	Support
H1a	GDOP	0.52	Medium	0.022*	YES
H1b	GDFP	0.58	Medium	0.012**	YES
H1c	GDEP	0.49	Medium	0.034*	YES
H1d	GDCS	0.22	Small	0.058	NO
H2a	GMOP	0.68	Large	***	YES
H2b	GMFP	0.67	Large	0.003**	YES
H2c	GMEP	0.70	Large	***	YES
H2d	GMCS	0.72	Large	***	YES
H3a	RLOP	0.21	Small	0.052	NO
H3b	RLFP	0.56	Medium	0.017*	YES
H3c	RLEP	0.54	Medium	0.003**	YES
H3d	RLCS	0.63	Large	0.001**	YES

Table 4 Structural Modelling Results

***Significance level 0.001, **Significance level 0.01, *Significance level 0.05

VII. CONCLUSIONS

The manufacturing scenario has started changing all over the world with the concept of globalization. In the view of making profits, many manufacturing organizations are creating damage to the natural resources. Therefore, not only business practices, but also GSCM practices also should be implemented in industries.

This paper is accomplished to find out the relationship between various GSCM practices and its organizational performance. The extensive literature was carried out in the area of GSCM to obtain various practices, performance outcomes and their definitions and benefits. Totally three main GSCM practices which are to be followed in

Copyright to IJARSCT www.ijarsct.co.in





International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)

International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal

Volume 3, Issue 4, June 2023

manufacturing organizations and four performance outcomes have been selected after consulting with industrial and academic experts.

To know the level of adoption of GSCM practices a questionnaire was framed and it was sent to different manufacturing organizations like automobile, FMCG, pharmaceutical, electrical and electronics etc. A thorough literature review was done to frame the questionnaire which consists of 46 questions related to 3 GSCM practices and 4 performance outcomes. A total of 138 responses were collected through offline as well as online mode.

A casual structural model consisting of three GSCM practices and four performance outcomes was developed using AMOS software. Data analysis was performed on Statistical Package for Social Sciences (SPSS) software. The model was prepared and analyzed with twelve hypotheses that were formulated. Results have shown that fit indices of the model CMIN/DF and RMSEA were not within the limits. Therefore, further model modification was carried out based on standardize path estimate for each item. Totally eight sub constructs (two each of green design, green manufacturing and operational performance, one each of financial performance and environmental performance) whose path estimate values are less than 0.5, were removed from the model. Modified model was analyzed and the modified results shows that fit indices of the model were within the acceptable limits.

Discriminant analysis results shows that all VE estimates are larger than the corresponding squared constructs correlation estimates. This indicates that each and every construct is different from the other. Therefore, modified model demonstrates high discriminant validity.

Structural model testing results have shown that ten out of twelve hypotheses were supported. Only two out of twelve hypotheses were not supported. Hypotheses H2a, H2c and H2d were significant at 0.001 level which indicates that all the green manufacturing practices are having high impact on organizational performance. Hypotheses H1b, H2b, H3c and H3d were significant at 0.01 level which indicates that some of the green design and reverse logistics practices are having medium impact on organizational performance. Hypotheses H1a, H1c and H3b were significant at 0.05 level which indicates that some of the green design and reverse logistics practices are having performance. The results have shown that green design is not having good impact on customer satisfaction and reverse logistics is not having good impact on operational performance.

REFERENCES

- [1] Balasubramanian, S., and Shukla, V. (2017), "Green supply chain management: an empirical investigation on the construction sector", Supply Chain Management: An International Journal, Vol. 22 No. 1, pp. 58-81.
- [2] Gerbing, D. W., and Anderson, J. C. (1988), "An updated paradigm for scale development incorporating unidimensionality and its assessment", Journal of marketing research, pp. 186-192.
- [3] Li, Y. H., and Huang, J. W. (2017), "The moderating role of relational bonding in green supply chain practices and performance", Journal of Purchasing and Supply Management, Vol. 23 No. 4, pp. 290-299.
- [4] Luthra, S., Garg, D., and Haleem, A. (2014), "Empirical analysis of green supply chain management practices in Indian automobile industry", Journal of The Institution of Engineers (India): Series C, Vol. 95 No. 2, pp. 119-126.
- [5] Mitra, S., and Datta, P. P. (2014), "Adoption of green supply chain management practices and their impact on performance: an exploratory study of Indian manufacturing firms", International Journal of Production Research, Vol. 52 No. 7, pp. 2085-2107.
- [6] Mohanty, R. P., and Prakash, A. (2014), "Green supply chain management practices in India: an empirical study", Production Planning & Control, Vol. 25 No. 16, pp. 1322-1337.
- [7] Sharma, M. (2014), "The role of employees' engagement in the adoption of green supply chain practices as moderated by environment attitude: An empirical study of the Indian automobile industry", Global Business Review, Vol. 15 No. 4, pp. 25-38.
- [8] Tseng, M. L., Tan, K., & Chiu, A. S. (2016), "Identifying the competitive determinants of firms' green supply chain capabilities under uncertainty", Clean Technologies and Environmental Policy, Vol. 18 No. 5, pp. 1247-1262.
- [9] Younis, H., Sundarakani, B., and Vel, P. (2016), "The impact of implementing green supply chain management practices on corporate performance", Competitiveness Review, Vol. 26 No. 3, pp. 216-245.

Copyright to IJARSCT www.ijarsct.co.in

