Harla Journals

Harla Journal of Sustainable Development in Business and Economics

Journal home page: https://journals.ddu.edu.et/index.php/HJSDBE

Harla journal of Sustainable Development in Business and Economics

The Effect of Green Supply Chain Management Practices on Operational Performance: A Case Study of Some Selected Manufacturing Firms in Dire Dawa City Administration

Tesfaye Kelbessa (MA), Ayalew Beyene (MA) and Eyoel Edossa (Assistant Professor)
Dire Dawa University, Department of logistic and supply chain Management
*E-mail address: tkelbessa8@gmail.com

Abstract

Green supply chain management is defined as a set of practices that are comprised of many activities starting from the generation of ideas and evolving through the design purchasing, logistics, manufacturing, and managing all kinds of waste. The purpose of this study was to examine the effect of green supply chain management practices on operational performance a case study of some selected manufacturing firms in Dire Dawa city administration. The researchers used an explanatory research design, both primary and secondary source of data was used to achieve the objective of the study. In this study, close-ended questionnaires were used for data collection procedures from selected respondents. The total populations of the study are 5626 and the researchers took 315 employees as sample respondents. In this study, the purposive sampling technique, both descriptive (mean and standard) and inferential statistics (Pearson and ordinal logistic regression) was used for the data analysis method. The researchers used a statistical package for social science software to analyze descriptive (percentage, mean, and standard deviation) and inferential statistics (Pearson correlation and ordinal logistic regression). The findings of the study imply that green purchasing, eco-design, and green manufacturing practices have a positive and significant effect on operational performance, whereas reverse logistics practice has a positive and insignificant effect on operational performance. Therefore, the researchers would recommend that the companies should give priority to green purchasing practices because green purchasing practices may affect the companies' performance more than the rest of green supply chain management practices.

Keywords: Green Supply Chain Management, Green Purchasing, Eco-design, Reverse Logistics, Green Manufacturing, Operational Performance.

**Corresponding author: Tesfaye K.* tkelbessa8@gmail.com

DOI:

Received month year; Received 23.09.2022; Accepted in revised form 30.11.2022; accepted 15.12.2022

1. Introduction

The business world is moving toward to "green concept" that organizations are focused on the increasing efficiency of resources while reducing the impact on human health, productivity, and the environment. Therefore, most of manufacturing firms are incorporating green supply chain management practices (GSCMP) into their operations for reducing pollution and wastage, recycling, reusing, minimalism issues resource uses, and reducing emissions(Waidyasekara & Sandamali, 2012).

GSCM is the new concept that has emerged as a key driver of business value which is defined as the integration of sustainable practices in SCM like product design, materials handling, manufacturing process, product distribution, and end-of-life management of the product in some case that leads to a reduction in profits (Daddhich etal, 2015). Based on this new concept, GSCM is defined as the attainment of many goals like economic, environmental, and social in systematic coordination of key inter-organizational business processes to enhance long-term performance for the organizations and their partners in the supply chain (Ageron et al., 2012). Several studies shows that green supply chain management is applied/practiced in different organizations as global, national and local context specifically in manufacturing firms. From the global perspective, the characteristics business environments are uncertain. Due to this reason, GSCM has emerged an important new approach for enterprises to achieve profit and market share objectives by reducing environmental risk and impact (Muma et al., 2014). The study conducted in China by (Zhu et al., 2011) investigated whether different Chinese manufacturer clusters varying in their extent of implementing green supply chain management exist from the ecological modernization perspective. The study also examined whether Chinese manufacturers' awareness of local and international environmental enhancing energy savings and pollution reduction-oriented compliance is related to green supply chain management implementation and also whether a mediating effect of regulatory pressure plays a major role. Therefore, the study found that the varying pace of Chinese manufacturers to ecological modernize with green supply chain management practices and the significance of regulatory pressure to distribute the adoption of the practices by the Chinese manufacturing industry.

From African perspective, various economic sectors in like agricultural firms have embraced green supply chain management practices. For example, British America Tobacco (BAT) combines elements of SCM such as procurement, vendor network management, waste disposal, product design with natural environment sustainable capabilities, policies of the products

designed for the environment, choosing suppliers with strong environmental credentials, and supplier involvement in the environmental management systems to create integrated green supply chain management practices intended to comply with the government regulations (BAT, 2010).

From the Ethiopian perspective, the government has put several policies, strategies, and laws that are designed to support sustainable development that implemented, and developed a wide range of legal, policy and institutional frameworks on the environment, water, forests, climate change, and biodiversity for managing environmental challenges. Therefore, when the environmental policy of Ethiopia was approved in1997 and the first key document that captured environmentally sustainable development principles. Ethiopia's Program of adaptation to climate change is a program of action to build a climate resilient economy through adaptation at sectoral, regional, and local community levels. Ethiopia has also an established overarching framework and a national strategy towards a green economy, the "Climate-Resilient Green Economy"(EPA, 2012).

Generally, in manufacturing industries, green supply chain management has emerged as a way to combine elements of environmental management, and supply chain management. Due to this reason, manufacturing firms are adopted green supply chain management practices in their activities to improve their operational performance like external factors which are linked to shareholder pressure while the internal factors stemming from business-led strategic process, an improved corporate image, increased efficiency, and innovation leadership (Testa & Iraldo, 2010) sharing the benefit of performance that firms are tempted to maximize their performance (Cao et al., 2019), properly designed environmental management in supply chain creates a competitive advantage, and result performance are the main reason behind that manufacturing industries for adopting green supply chain management.

Standing from this point of view, over the past years, businesses have become aware of the strategic importance and critical nature as well as the role of the environment in shaping today's competitive market (Lai et al., 2010). This has subsequently driven manufacturing businesses to revise their corporate business strategies as well as the core supply chain activities towards a greener environmental approach (Sarkis et al., 2011). However, there are different problems that affect green supply chain management in different organizations. For example, (Ojo et al., 2014) stated that the major challenges facing in green supply chain management practices are public awareness, lack of knowledge about environmental impacts, a poor commitment by top management, and lack of legal enforcement by the government, lack of resources, lack of

sustainable practices in the organization's vision and mission, lack of market for recyclable materials, lack of information sharing between construction firms/suppliers and lack of demand. Similarly, tack of adequate environmental measures like training/development, sustainable auditing, and certifications like ISO 14001 are the additional challenging that some organizations to adopt the green supply initiatives mainly because of the competitive and uncertain nature of the construction industry are the external challenges implementing green supply chain management(Balasubramanian, 2012).

In Ethiopia context, different challenges are an enabling environment for resilient green transformations are includes policy and regulatory framework for environmental management (predominant use of command-and-control approaches which do not refer to any economic-based instruments and lack of incentive to reduce the potentially high transaction. the institutional framework for an environmental, environmental impact assessment (EIA) system challenge(enforcement of the existing policies, laws, and regulations are weak, and regulations need to fit better with the climate-resilient green economy strategy) and coordination challenges (the allocation and use of resources for competing uses require more dialogue and greater coordination among stakeholders) to achieve sustainable development (EPA, 2012).

Generally, as the knowledge of the researchers concerned on the study area is very little work has carried out in Ethiopia, is the main reason that is necessary for research on the effect of green supply chain management practices on operational performance by considering the gap of gas emission, dust, water pollution, breakdown of sack which is lost on land, highlands lost on the earth, chemical pollutions released from company to the environment, and the plastics lost in the soil in the manufacturing firms. In addition to this the researchers motivated on the area of the study which is previous researches are not focused on the practice of green supply chain management by considering manufacturing industries such as cement factories, food complex and soap/detergent factories. Therefore, due to this research gap, the researchers were trying to investigate the effect of green supply chain management practices dimensions of green purchasing (GP), eco-design (ED), reverse logistics (RL), and green manufacturing (GM) to fill theoretical and practical gaps of green supply chain management practices on operational performance in the case some selected manufacturing firms in the Dire Dawa City Administration.

2. Literature Review

2.1. Theoretical Review

2.2.1. Resource Based View Theory

From theoretical review point of view, green supply chain management practices are playing an important role for the manufacturing firms to improving their operational performance. In this study, the researchers try to discuss the theoretical review of green supply chain management via resource-based theory, ecological modernization theory, and institutional theory point of view. Resource-based theory (RBT) argues that sustainable competitive advantage accrues from the deployment of the firm idiosyncratic resources, which are strengths, and weaknesses of the firm that allow achieving their goals, and objectives. Firms' resources could be in several forms ranging from a tangible assets such as machines, equipment, an intangible asset like goodwill, organizational attributes, routines, processes, capabilities, knowledge input transformation, and output resources (Agyapong et al, 2019).

According (Ashrafi & Mueller, 2015)resource based theory is one of the most influential theories that are used to consider resources as the prominent source of achieving sustainable competitive advantage in firms. For instance, the use of green manufacturing and cleaner production strategies often attributes the competitive advantage and contributes to the performance of enterprises.

2.2.2. Ecological Modernization Theory

In the ecological modernization theory also suggests that environmental regulations and policies can motivate green supply chain management practices among manufacturer and green supply chain management practices are consistent with the concept of environmental innovation from the ecological modernization theory point of view, that manufacturers are implementing green supply chain management through hard (cleaner production equipment) and soft (increased supplier collaboration in eco-design) technological innovation (Janicke, 2008).

EMT also suggests that environmental regulations and policies can motivate GSCMPs among manufacturers (Janicke, 2008). The practices of GSCM are consistent with the concept of environmental innovation from the EMT point of view, that manufacturers are implementing GSCM through hard (cleaner production equipment) and soft (increased supplier collaboration in eco-design) technological innovation (Zhu et al., 2010).

2.2.3. Institutional theory

In the institutional theory, the companies have institutionalized environmental practices owing to pressure from external and internal forces as well as an awareness of the consequences of

non-compliance with environmental imperatives and also it is the requirement for manufacturing firms to implement green strategies owing to increased external pressure for sustainability in the form of compulsory environmental regulations that are directly related to green (Lee & Sung 2013). The institutional theory offers a useful research framework for the study of green supply chain management in respect to how external forces firms to implement certain GSCMPs (Sarkis et al., 2010).

2.2. Empirical Review

Several scholars have researched in the field of green supply chain management practices on operational performance. For example, (Mallikarathna & Silva, 2019) study was conducted on the impact of green supply chain management practices on operational performance and customer satisfaction by using the variables green purchasing, cooperation with customers, eco-design and investment recovery, and operational performance (flexibility, delivery, quality, and Cost). The results of the study shows that the dimensions overall green supply chain management practices are significantly and positively linked with all the dimensions of operational performance.

(Mafini & Okoumba, 2018) extend green supply chain management activities to manufacturing small and medium enterprises in a developing economy by using the variables of green purchasing, reverse logistics, green manufacturing, and environmental collaboration on operational performance. The study confirms the view that implementation of green supply chain management activities positively contributes to operational performance in manufacturing SMEs. The study further concludes that operational performance in manufacturing SMEs in South Africa positively influences supply chain performance.

(Santos et al., 2019) conducted on integrating green practices into operational performance evidence from Brazilian Manufacturers. The objective of the study was to analyze the effect of adopting green supply chain management practices with suppliers and customers on operational performance in Brazilian manufacturing companies and to verify that the relationship is stronger when green practices are adopted jointly with suppliers and customers to check that the adoption of environmental practices in a balanced way with suppliers and customers in green practices improves operational performance items which include (performance of products, unit cost, product quality, customer support, time needed, capacity to meet customers' requirements, pace of new product launching and flexibility to adapt to demand). The study found that the adoption of environmental practices with suppliers alone, with customers, and in conjunction with both suppliers and customers has a major positive impact on organizational operational performance.

(Yue, & Chavez, 2014) empirically tested a conceptual framework of integrated green supply chain management practices and operational performance (flexibility, delivery, quality, and cost) with the help of the structural equation modeling method. They found a significant positive relationship in integrated green supply chain management practices with internal green supply chain management, green supply chain management with customers, and green supply chain management with suppliers and operational performance of automobile manufacturers in China.

(Gill et al., 2019) conducted on the influence of green supply chain management practices on operational performance: an empirical study amongst Pakistani textile manufacturers. The study concludes that from the structural model analysis (hypotheses testing) green purchasing has no significant positive influence on operational performance, whereas eco-design and environmental cooperation with customers have a significant positive influence on operation performance.

(Ochieng, 2019) conducted on the effect of the green purchasing practices on the performance of large chemical manufacturing firms in Nairobi County Kenya. The study concluded that green purchasing positively and significantly affects the performance of large chemical manufacturing firms in Kenya. An increase in the practice of green manufacturing system, purchasing energy- saving equipment's by the company, purchasing products that have been stamped by reliable eco-labels, cooperating with suppliers to ensure standard packaging, and allowing for reverse logistics by accepting products back from consumers positively influences the performance of large chemical manufacturing in Kenya.

(Mahmoud , 2019) study conducted on the effect of green supply chain practices on operational performance a case study of bench-marking between shell and co-operation Petroleum Company in Egypt. The study concluded that Shell used green supply chain management practices. Statistical analysis showed that GSC practices had a strong impact on operational performance and how these practices had positive effects on Shell's operational performance that is generally possible to conclude that green supply chain practices can help companies in the lubricant industry to improve operational performance.

2.2.1. Literature Gap

Generally, from the above literature review, it can be easily the comprehensible significance of green supply chain management practices and their influence on a different perspective of the organizations that developed the way to combine an element of environment management, and supply chain management to increase the efficiency of a resources while reducing the impact on human wealth, productivity and the environment. But there is a lack of previous

studies concerning green supply chain management practices implementation and how an effect organizational operational performance in manufacturing industries in Ethiopia, specifically cement factories, mineral water factories, food factory, soap, and detergent factory. Therefore, the researchers are considering this situation; trying to investigate what the effect green supply management practices are looks like in cement factories, mineral water factories, food factory, soap, and detergent factory that is going to fulfill the theoretical and practical gap.

In this study, we try to identify the previous research that are discussed by different scholars on the gap of green supply chain management practices and operational performance.

(Golicic&Smith, 2013) stated that there is inconsistency in the literature regarding to the relationship between green supply chain management practices and operational performance.(Vanalle et al., 2017) discussed requires further investigation to evaluate the influence of green supply chain management practices on operational performance at the organization.(Mitra &Datta, 2014) elaborate that there is insufficient research concerning green supply chain management practices in developing countries. It would be beneficial to explore the implementation of green supply chain management practices and their influence on operational performance. (Luthra et al., 2012) despite a large body of literature on green supply chain management appearing in most previous studies has focused their emphasis on large corporations are disregarding SMEs, and in developing countries like South Africa, the level of environmental mindfulness among SMEs may still below. There is a need to conduct more studies on issues of green supply chain management within such enterprises (Coetzee & Bean, 2016)(Craggs, 2012), (Mvubu and Naude, 2016) and (Niemann etal., 2016).

3. Materials and Methods

In this study, an explanatory research design was employed. Because explanatory research design involves to estimates the causal effect between variables. Causal research design can be carried out to identify the extent or nature of the cause-and-effect relationship between variables to examine the effect of specific changes on existing norms and processes while offering a great level of validity due to the systematic selection of subjects.

For the study achievement, the data was obtained from primary and secondary sources. A self-administered questionnaire was distributed to the target respondents of the company based on the response of close-ended items questions were elicited on a 5-point Likert scale with 1=Strongly Disagree, 2= Disagree, 3=Moderate, 4=Agree, and 5= Strongly Agree.

Ten (10) manufacturing firms Dire Dawa city administration was included in our study. Those are National cement factory, Ture cement factory, Vita water factory, Ayaan water factory,

Aqua Dire water factory, Eftein water factory, Liban water factory, Aqua Uno water factory, Dire Dawa food complex, Shemu soap and detergent factory. Currently, the total numbers of the population in the case study are 5626 employees. Therefore, the researchers took 315 sample sizes from among factories for the study achievement the researchers were selected a large sample size (315) consider as sample respondents by using (Malhorta, 2007) sample size determination method through considering the heterogeneity of sample respondents on the basic of position within the organization. The main reason researchers took the large level sample size (315) is the total population of the case area is 5626. It is approximately nearest to the largest level of sample assumption of (Malhorta, 2007).

Both descriptive and inferential statistics were employed. Descriptive data analysis is used to summarize, describe and present quantitative information in the form of mean and standard deviation. Inferential statistics was including Pearson correlation and ordinal logistic regression. Inferential statistics describe the relationship between green supply chain management and operational performance. Ordinal logistic regression analysis can be deal with model fitting information, goodness-of-fit, Pseudo R-square, parameter estimates, and test of parallel lines. The reason the researchers use ordinal logistic regression is the model of the dependent variable is ordered in nature.

Therefore, the statistical package for social science (SPSS) software was used to analyze of data for given parameters.

3.1.Descriptive Statistics

"Table1". Descriptive Statistics of Green Supply Chain Management Practices and Operational Performance

Variables	**Descriptive Statistics**	
	Mean	**Stand. Dev**
GP	3.58	1.139
ED	3.43	1.217
RL	3.27	1.299
GM	3.44	1.087
OP	3.32	1.125

Source: (Researchers survey, 2022)

The first objective of the current study pursued to examine the effect of green purchasing practice on operational performance. Mean and standard deviation was used to explore responses from employee questionnaires. Six items were used to explore employees from respective department units awareness of the nature green purchasing practice used in manufacturing firms in Dire Dawa city administration. The above table 1, indicates that the

overall mean score response among employees about green purchasing practice used in some selected manufacturing firms was 3.58. This value is found in the interval 3.5<R<4.5 which implies that employees seemed to show agreement with the use of green purchasing practices in the manufacturing firms and the overall standard deviations (SD=1.139) which is an indication of consistency in agreements among the respondents. These results imply that employees agree that the manufacturing firms in Dire Dawa city administration have a good practice of green purchasing towards increasing operational performance because green purchasing is important in an organization that assesses the performance of the suppliers to undertake measures that ensure environmental quality in their operational systems. Many previous review works of literature have given evidence showing that green purchasing is an environmental procurement that involves reduction, reuse, and recycling materials(Chowdhury et al., n.d.2015), (Diab et al., 2015) and (Ninlawan et al., 2010).

The second objective of the study required to examining the effect of eco-design practice on operational performance. A total of six items were used to explore employees from respective department units' awareness of the nature eco-design practice being used in some selected manufacturing firms in Dire Dawa city administration. In the above table 1, revealed that the overall mean score response among employees about eco-design practice used in some selected manufacturing firms was 3.43. This value is found in the interval 2.5<R<3.5 which implies that employees seemed to show moderately agree with the use of the eco-design practices in the manufacturing firms and the overall standard deviations (SD=1.217) which is an indication of consistency in agreements among the respondents. The implication of these results implies that employees agree that manufacturing firms in Dire Dawa city administration have a moderate practice of eco-design towards increase operational performance. This finding is evidenced from review literature that ED is a practice that integrates environmental concerns in a product or process design, and it influences the entire life cycle of a product. As it was discussed by (Karlsson & Luttropp, 2007) argue that eco-design also should to include the concepts of sustainable consumption, reduction of the volume of desire, and aims to enable human satisfaction in concert with a positive role in the sustainable product development.

The third objective of the current study pursued to analyze the effect of reverse logistics practice on operational performance. Means and Standard deviations were used to explore responses from employee questionnaires. Six items were used to explore employees from respective department units' awareness of the nature of reverse logistics practice being used in some selected manufacturing firms in Dire Dawa city administration. The above table 1

revealed that the overall mean score response among employees concerning reverse logistics practice used in some selected manufacturing firms was 3.27. This value is found in the interval 3.5<R<4.5 which implies that employees seemed to show agreement with the use of reverse logistics practice in the manufacturing firms and the overall standard deviations (SD=1.299) which is an indication of consistency in agreements among the respondents. These results imply that manufacturing firms operating in Dire Dawa city administration recognize the important effect of reverse logistics practice towards to increasing operational performance. This finding is consistent with review literature evidence that reverse logistics involves the activities to avoid returns, to reduce materials in the forward system to reduce materials flow back and ensure reuse and recycling of materials (Xie & Breen, 2012)stated that when the organization implements reverse logistics practice is to recycling and waste logistics which can be established according to the actual need for the collection, classification, processing, packaging, handling, storage, and distribution to the specialized treatment facility for processing.

The fourth objective of the current study pursued to investigate the effect of green manufacturing on operational performance. A total of six items were used to explore employees from respective department units' awareness of the nature green manufacturing practice being used in some selected manufacturing firms in Dire Dawa city administration. The above table 1 revealed that the overall mean score response among employees concerning green manufacturing, practice used in some selected manufacturing firms was 3.44. This value is found in the interval 2.5<R<3.5 which implies that employees seemed to show moderately agree with the use of green manufacturing practice in the manufacturing firms and the overall standard deviations (SD=1.087) which is an indication of consistent in agreements among the respondents. These results imply that manufacturing firms operating in Dire Dawa city administration recognize the important effect of green manufacturing practices towards increasing operational performance. This finding is evidenced from previous review literature shows that GM is the production processes that use inputs with minimal or reduced environmental impacts and which are highly efficient, and are associated with little or no waste or pollution (Amemba et al., 2013) and (Al-odeh & Smallwood, 2012) stated that green manufacturing with clean production method, efficient technology, reduced raw materials, and resources to reach low input, high output, and low pollution.

1.1. Correlation Analysis

"Table2". Correlation matrix for Green Supply Chain Management Practices and Operational Performance

Variables	Pearson Correlation	GP	ED	RL	GM	OP
GP	Pearson Correlation	1				
	Sig. (2-tailed)					
	N	285				
ED	Pearson Correlation	.692**	1			
	Sig. (2-tailed)	.000				
	N	285	285			
RE	Pearson Correlation	.673**	547**	1		
	Sig. (2-tailed)	.001	.000			
	N	285	285	285		
GM	Pearson Correlation	.768**	.701**	.628**	1	
	Sig. (2-tailed)	.000	.000	.000		
	N	285	285	285	285	
OP	Pearson Correlation	.623**	.606**	.470**	.641**	1
	Sig. (2-tailed)	.000	.000	.000	.000	
	N	285	285	285	285	285
****. Correlation is significant at the 0.01 level (2-tailed)**						

Source: (Researchers Survey, 2022)

From the above table2 indicates that there is there is a positive relationship between green purchasing and operational performance with Pearson correlation (r= 0.623) and at significance p-value (p=.000) which is less than 0.01. This implies that green purchasing and operational performance are strongly correlated. This shows increasing in green purchasing practices such as environmental requirements for purchased items, environmental audit for suppliers' internal management, working with suppliers to address environmental problems, eco-product labeling system, the products preferred consuming fewer natural resources, and purchasing materials that are green attributes leads to a positive and significant effect on the operational performance of manufacturing firms in DDCA. This finding is consistent with (Fredrick and Justus , 2019)the summary of the correlation results shows that there was a strong positive and significant association between green purchasing practices and the performance with a Pearson coefficient of (0.577) and a significance level of (0.000).

On the other hand, the above table 2 demonstrates that there is a positive relationship between eco-design and operational Performance with Pearson correlation (r=0.606) and at significance p-value (.000) which is less than 0.01. This implies that eco-design and operational performance are strongly correlated. This finding is similar to(Jr et al., 2012) correlation matrix shows that there is a positive relationship between eco-design and operational performance with a Pearson correlation coefficient of (r= 0.482) and at significance level (0.01).

Similarly, the result presented in the above table2 shows that there is a positive relationship between reverse logistics and operational performance with Pearson correlation (r=0.470) and at significance p-value (p=.000) which is less than 0.01. This implies that reverse logistics and

operational performance are medium correlated. This finding is consistent with (Bor, 2021) correlation analysis shows that the Pearson coefficient of 0.401 was obtained and the significant value was obtained at (p=.000) which was below 0.05 at 1-a tailed test conducted in the study implying a moderate positive significant relationship between reverse logistics and performance.

Additionally, the above table2 revealed that there is a positive relationship between green manufacturing and operational performance with Pearson correlation (r=0.641) and at significance p-value (p=.000) which is less than 0.01. This implies that green manufacturing and operational performance are strongly correlated. This finding is consistent with (Bor, 2021) summary of correlation analysis shows that green manufacturing had the strongest correlation with a performance at Pearson correlation (r= .533) and a significance p-value (p= .000).

3.2.Ordinal Logistics Regression

3.2.1. Model Fitting Information

"Table3". Model Fitting Information

Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	Df	Sig.
Intercept Only	506.496			
Final	321.815	184.681	4	.000

Link function: Logit

Source: Researchers Survey, (2022)

The Model Fitting information in the above table 4.12 contains the -2Log Likelihood for an Intercept- Only (null) model and Final model (containing the full set of predictors). The likelihood ratio Chi-square test to test whether there is a significant improvement in Fit of the Final model relative to the Intercept-Only model. In this case, it is possible to conclude that, there is a significant improvement in Fit of the Final model over the null model (Intercept-Only) model [x^2 (4)= 184.681 that means 506.496-321.815, and the p-value is < .000].

3.2.2. Goodness-of Fit

"Table4". Goodness-of Fit

Goodness-of Fit

	Chi-Square	Df	Sig.
Pearson	581.605	550	.170
Deviance	316.269	550	1.000

Link function: Logit.

Source: Researchers Survey, (2022)

The Goodness of fit in the above table 3 contains both the Deviance and Pearson Chi-Square tests, which are useful for determining whether a model exhibits a good fit to the data. Non-

significant test results are indicators that the models fit the data. In this analysis, it is possible to understand both the Pearson Chi-square test [x^2 (550) = 581.605, p= .170] and the deviance [x^2 (550) = 316.269, p= 1.000] were both non-significant. Therefore, these results suggest a good model fit.

3.2.3. Pseudo R-Square

"Table4". Pseudo R-Square

Cox and Snell	.477
Nagelkerke	.572
McFadden	.361

Link function: Logit.
Source: Researchers Survey, (2022)

The Cox and Snell R Square and Nagelkerke R Square values are indicating the amount of variation in the dependent variable explained by the model (from the minimum level 0 to a maximum of approximately 1). In this case, the above table 4.14 shows that the two values are 0.477and 0.572 respectively. The model as a whole explained 47.7% (Cox and Snell R Square) and 57.2% (Nagelkerke R Square) of the variance of operational performance.

3.3.Test Parameter Evaluation of Independent Variables

"Table5". Parameter Evaluation of each Independent Variable

Parameter		B	Std. Error	Hypothesis Test			Exp(B)	95% Wald Confidence Interval for Exp(B)	
				Wald Chi-Square	df	Sig.		Lower	Upper
Threshold	[OP=2.00]	9.108	1.1371	64.162	1	.000	9029.512	972.223	83861.521
	[OP=3.00]	14.556	1.5008	94.074	1	.000	2097703.554	110732.863	39738520.897
GP		.960	.3330	8.305	1	.004	2.611	1.359	5.015
ED		1.194	.3270	13.322	1	.000	3.299	1.738	6.262
RL		.311	.1649	3.548	1	.060	1.364	.987	1.885
GM		1.479	.3739	15.635	1	.000	4.387	2.108	9.130

Dependent Variable: OP

Model (Threshold): GP, ED, RL, GM

a. Fixed at the displayed value

Source: Researchers Survey, (2022)

3.4. Hypotheses Testing

As it was explained in the previous chapter one, four (4) hypotheses were formulated. The assumption of these hypotheses was tested for all independent variables (GP, ED, RL, and GM) that have a positive and significant effect on operational performance in chapter one. From the

above table5, the parameter of each independent variable of green purchasing, eco-design, reverse logistics, and green manufacturing are tested as follow.

H1: Green purchasing has a positive and significant effect on operational performance

As green purchasing increases by one unit, all other variables are constant at their value, there is a predicted increase of .960 in the Log odds of being in a higher (as opposed to a lower) category on operational performance at (β= .960 and p=.004). This indicates that green purchasing has a positive and significant effect on operational performance. Therefore, the alternative hypothesis was accepted. This finding is consistent with a previous study by (Mafini and Okoumba, 2018)proposed that green purchasing exerts a positive influence on operational performance. This hypothesis was accepted because there was a positive and significant relationship (β = 0.654; p = 0.007; t = 2.445) between green purchasing and operational performance. This result implies that implementation of green purchasing by manufacturing SMEs predicts their operational performance. In the other study conducted by (Ochieng, 2019) the regression coefficient revealed that green purchasing practices had a positive and significant effect on the performance of large chemical manufacturing firms in Kenya (β=0.385, Sig=0.000). This implies that an increase in the include practicing green manufacturing system, purchasing energy-saving equipment's by the company, purchasing products that have been stamped by reliable eco-labels, cooperating with suppliers to ensure standard packaging, and allowing for reverse logistics by accepting products back from consumers leads to a 0.385-unit effect in the performance of large chemical manufacturing firms in Kenya.

H2: Eco-design has a positive and significant effect on operational performance

As eco-design increases by one unit, all other variables are constant at their value, there is a predicted increase of 1.194 in the Log odds of being in a higher (as opposed to a lower) category on operational performance at (β= 1.194 and p=.000). This indicates that eco-design has a positive and significant effect on operational performance. Therefore, an alternative hypothesis was accepted. This study consistency with the study conducted by (Gill et al., 2019)states that eco-design has a significant positive influence on operational performance (β=0.437; t=3.751) and the hypothesis was also supported.

H3: Reverse logistics has a positive and significant effect on operational performance

As reverse logistics increases by one unit, all other variables are constant at their value, there is a predicted increase of .311 in the Log odds of being in a higher (as opposed to a lower) category on operational performance at (β= .311), and p= .060). This indicates that reverse logistics has a positive and insignificant effect on operational performance. Therefore, an

alternative hypothesis was rejected. This finding is consistent with (Ng'endo , 2017)analysis shows that a unit decrease in performance is explained by a 0.9% decrease in reverse logistics. Therefore, the concludes that the reselling, re-using, packages, and reduction of cost due to recycling influence performance to a small extent in the tea factories.

H4: Green manufacturing has a positive and significant effect on operational performance

As green manufacturing increases by one unit, all other variables are constant at their value, there is a predicted increase of 1.479 in the Log odds of being in a higher (as opposed to a lower) category on operational performance at (β= 1.479, and p= .000). This indicates that green manufacturing has a positive and significant effect on operational performance. Therefore, an alternative hypothesis was accepted. This finding is consistent with (Bor, 2021) of the regression coefficients revealed that green manufacturing had a significant effect on the performance of food and beverage processing firms in Kenya at (β= .0563 and p-value = 0.000< 0.05). The findings imply that a unit change in green manufacturing can explain up to 56.3% of the performance of the food and beverage processing firms. Therefore, justifies the decision to accept the alternative hypothesis that green manufacturing significantly and positively affects the performance of food and beverage processing firms in Kenya.

3.5.Test of Parallel Lines

In the ordinal logistic regression, assume that the relationship between independent variables is the same across all comparisons, which involve the dependent variables an assumption referred to as proportional odds. In this study, the result of parallel test lines (assumption of proportional odds) indicates non-significance that interprets assumption is satisfied. In addition to this, in parallel test lines, if the values are significant, the results assumptions are not satisfied.

"Table6". Tests of Parallel Lines

Tests of Parallel Lines

Model	-2 Log Likelihood	Chi-Square	Df	Sig.
Null Hypothesis	321.815			
General	318.672	3.142	4	.534

The null hypothesis states that the location parameters (slope coefficients) are the same across response categories.

a. Link function: Logit

Source: Researchers Survey, (2022)

As mentioned in the logistic regression assumes that the relationship between the independent variables is the same across all possible comparisons involving independent variable assumption referred to as Proportional Odds. When the result of the test parallel lines (assumption of proportional odds) indicates non-significance, then, it interprets to mean that the assumption is satisfied. On other hand, the statistical significance is taken as an indicator that the assumption is not satisfied. Therefore, in the result analysis of table 4.16, the assumption test of proportional odds is satisfied as (p-value =.534 which is greater than 0.05), and the main assumption of the ordinal regression is checked.

4. Results and Discussion

4.1. Results

The general objective of the study was to examine the effect of green supply chain management practices on operational performance in the case of some selected manufacturing firms in Dire Dawa city administration. Based on data the analysis, interpretation, and results from the following summary of findings were drawn.

The study established that the mean value of green purchasing, eco-design, reverse logistics, and green manufacturing practices have a mean value of (3.58), (3.43), (3.27), and (3.44) respectively. All green supply chain management practices green purchasing practices, eco-design practices, reverse logistics practices, and green manufacturing practices can affect the operational performance of manufacturing firms in Dire Dawa city administration like Ture cement factory, National cement factory, Vita water factory, Ayaan water factory, Aqua Uno water factory, Libaan water factory, Eftein water factory, Aqua Dire water factory, Dire Dawa food complex, Shemu soap, and detergent factory.

The study found that green manufacturing practice has the highest correlation coefficient (r= .641), followed by green purchasing practice (r= .623) eco-design practice (r=.606) and reverse logistics practice (r= .470). This implies that there is a positive and strong relationship between green supply chain management practices and operational performance.

From the regression results, green manufacturing has the highest effect on operational performance with Beta value (B= 1.479) followed by eco-design (B= 1.194), green purchasing (B= .960), and reverse logistics (B= .311).

From the ordinal logistic regression assumptions shows that there is significant improvement model fitting information of fit of final model of Chi square intercept- only at the value of (p= 0.000), goodness of fit shows that there is non-significant results indicator fit of model at the values of Pearson chi square [x^2 (550) = 586.605, p= .170] and Deviance [x^2 (550) =316.269, p= 1.000], the Pseudo R square explained that the variation of dependent variables by the model

via Cox and Snell R Square 47.7% and Nagelkerke R Square 57.2% and the test of parallel line shows that he assumption test of proportional odds is satisfied as (p-value =.534 which is greater than 0.05), and the main assumption of the ordinal regression is checked.
From the hypotheses tests show that green purchasing practice, eco-design practices, and green manufacturing practices have a positive and significant effect on operational performance but, reverse logistics practice has a positive and insignificant effect on operational performance

4.2.Discussions of the Study

The general objective of the study was to examine the effect of green supply chain management practices on operational performance in the case of some selected manufacturing firms in Dire Dawa city administration. The researcher has formulated basic research questions based on the specific objectives that were to be answered through the investigation of the study. Therefore, the summary of the discussion was presented as follows.

The result of the study shows that green purchasing has a positive and significant effect on operational performance. This finding is supported from previous review works of literature have given evidence showing that green purchasing is an environmental procurement that involves reduction, reuse, and recycling materials(Chowdhury et al.,2015), (Diab et al., 2015)and (Ninlawan et al., 2010).

On the other hand, the result of the study shows that eco-design has a positive and significant effect on operational performance. The result of this result was similar with (Diab et al., 2015)stated that eco-design requires manufacturers to design their products that minimizes the consumption of materials/energy, facilitate the reuse, recycling, recovery of components, materials, and also avoid/reduce the use of hazardous materials in manufacturing by replacing the hazardous materials with less problematic materials (Amemba et al., 2013).
The result of the study shows that reverse logistics has a positive and insignificant effect on operational performance. This finding is consistent with (Ng'endo , 2017)analysis shows that a unit decrease in performance is explained by a 0.9% decrease in reverse logistics. Therefore, the concludes that the reselling, re-using, packages, and reduction of cost due to recycling influence performance to a small extent in the tea factories.

Lastly, the result of the study shows that green manufacturing has a positive and significant effect on operational performance. This finding is evidenced from previous review literature shows that green manufacturing is the production processes that use inputs with minimal or reduced environmental impacts and which are highly efficient, and are associated with little or

no waste or pollution (Amemba et al., 2013)and (Al-odeh & Smallwood, 2012)stated that green manufacturing with clean production method, efficient technology, reduced raw materials, and resources to reach low input, high output, and low pollution.

5. Conclusions

From descriptive statistics analysis results shows that the dimensions of green supply chain management practices such as green purchasing, eco-design, reverse logistics, and green manufacturing in some manufacturing firms in Dire Dawa city administration achieved a composite mean score above the average. This implies that the feelings of the respondents currently in the company apply relatively have good green supply chain management practices. The finding shows that the mean result of green purchasing has the highest mean value followed by green manufacturing, eco-design and reverse logistics. This indicates that cement factories, water mineral factories, food complex, and soap and detergent factory have good green purchasing practices. In addition to the mean result, the correlation analysis shows that green manufacturing has the highest correlation coefficient followed by green purchasing, eco-design, and reverse logistics. From multiple regression analyzes green purchasing practice, eco-design practice, and green manufacturing practice have a positive and significant effect on operational performance but, reverse logistics has a positive and insignificant effect on operational performance. From the ordinal logistic regression assumptions shows that there is significant improvement model fitting information of in fit of final model of Chi square intercept- only, goodness of fit shows that there is non-significant results indicator fit of model of Pearson chi square and deviance, the Pseudo R square explained that the variation of dependent variables by the model via Cox and Snell R Square and Nagelkerke R Square and the test of parallel line shows that he assumption test of proportional odds is satisfied/the main assumption of the ordinal regression is checked. Finally, the evaluation of each parameter of independent variables coefficient analysis green manufacturing has the highest effect on operational performance with Beta values followed by eco-design, green purchasing, and reverse logistics.

5.1. Recommendations

Based on the findings, green supply chain management practices were relatively well practiced in the manufacturing firms (cement factories, water mineral factories, food complex factory, soap, and detergent factory). But, the mean score of reverse logistics practice was low with compared to other variables like green purchasing, eco-design and green manufacturing. Therefore, the manufacturing firms should give better attention to reverse logistics practice and find out the means to improve operational performance of the manufacturing firms by applying

modern technology rather than using human power to facilitate the reverse logistics practice and associated costs.

From the correlation analysis reverse logistics has the moderate relationship with operational performance. Therefore, the manufacturing firms should give due attention and more practice on this activity in order to minimize the costs of production and other logistics related costs such as transportation cost, inventory costs, warehousing costs, and material handling costs.

From the findings reverse logistics has a positive and insignificant effect on operational performance. Therefore, the company should give attention to reverse logistics practice by applying this practice with other logistics activities in the integrated manner in the case companies to improve operational performance in the manufacturing firms.

In addition to this, green purchasing practice has the highest mean value or has the highest percentage of contribution to operational performance with compared to other variables, Due to this fact the manufacturing firms should give more emphasis to this practice because it was affecting the organization more than the rest of green supply chain management practices.

Acknowledgements

First of all, we would like to express our deepest gratitude to almighty god for helping us throughout our life. Secondly, we would like to express my appreciation to Dire Dawa University to support finance aid for the valuable insight given chance to complete the research work. We would also like express our great thanks to all Nation cement factory, Ture cement factory, Dire Dawa food complex share company, Shemu soap and detergent factory, Aqua Dire mineral, Vita mineral water, Eftein mineral water, Ayaan mineral water, Free mineral water and Libaan mineral water factory employees who helped ours to fulfill questionnaire to accomplish this study.

Conflict Interest

The authors declare that there is no competing interest.

References

Ageron, B., Gunasekaran, A., & Spalanzani, A. (2012).Production Economics Sustainable supply management : An empirical study. *International Journal of Production Economics*, *140*(1), 168–170. https://doi.org/10.1016/j.ijpe.2011.04.007.

Al-odeh, M., & Smallwood, J. (2012). Sustainable Supply Chain Management : Literature Review , Trends , and Sustainable Supply Chain Management : Literature Review , Trends , and Framework. *International Journal of Computuational Engineering and Manangement*, *15*(1), 85–90.

Ashrafi. R.,&J. Mueller , (2015). Delineating it Resources and Capabilities to Obtain Competitive Advantage and Improve Firm Performance. Journal of Information Systems Management 32(1): 15–38.

Amemba, C. S., Nyaboke, P. G., Osoro, A., & Mburu, N. (2013). Elements of Green Supply

Chain Management. *European Journal of Business and Management*, *5*(12), 51–61.

Balasubramanian, S. (2012). A Hierarchical Framework of Barriers to Green Supply Chain Management in the Construction Sector. https://doi.org/10.5539/jsd.v5n10p15

BAT. (2010). Suistanable business policyof Bidco ltd retrieved from :http://www.bat.com/group/sites/UK. *An International Journal*, *17*(3), 363–377. https://doi.org/10.1108/14635771011049344.

Bilha Ng'endo Mugo. (2017). Effect of Green Supply Chain Management Practices on Performance of Tea Factories in Central Region Kenya. A Dissertation Submitted in Partial Fulfillment of The Requirements for the Award of the Degree of Masters in Business Administration in the School of Business ond Public Management. Unpublished Material.

Bor, J. K. M. (2021). Green Supply Chain Management Practices And Performance Of Food And Beverage Processing Sector in Kenya Jones. Jomo Kenyatta University of Un published Materials.

Cao, G., Duan, Y., & Cadden, T. (2019). The link between information processing capability and competitive advantage mediated through decision-making e ff ectiveness. *International Journal of Information Management*, *44*, 121–131. https://doi.org/10.1016/j.ijinfomgt.2018.10.003.

Chowdhury, M. A. I., Kingdom, U., Lecturer, S., Kingdom, U., Briggs, A., Lecturer, S., Kingdom, U., Kingdom, U., & Kingdom, U. (2015). *An empirical analysis of green supply chain management practices in Bangladesh construction industry*. 1–10.

Coetzee, N., & Bean, W. L. (2016). A green profitability framework to quantify the impact of green supply chain management in South Africa. *Journal of Transport and Supply Chain Management*, *10*(1), 1–15. https://doi.org/10.4102/jtscm.v10i1.251.

Craiggs, J., (2012). 'Maturity assessment of green supply chain management in the South African FMCG Industry', Bachelor's dissertation, Faculty of Engineering, Built Environment and Information Technology, University of Pretoria, South Africa, viewed 11 February 2018, from https://repository.up.ac.za/ handle/2263/21027..

Daddhich , P., Genovese, A., Kumar, N. and A. (2015). Developing suistanble supply chains in the UK construction industry case study. *International Journal of Production Economics*, *164*(271–284). https://doi.org/10.1108/14635771011049344.

Diab, S. M., Al-bourini, F. A., & Abu-rumman, A. H. (2015). The Impact of Green Supply Chain Management Practices on Organizational Performance : A Study of Jordanian Food Industries. 5(1), 149–157. https://doi.org/10.5539/jms.v5n1p149.

EPA. (2012). Environmetal Protection Authority. *National Report of Ethiopia, the United Nations Conference on Suistanable Development (Rio+20). Federal Democratic Republic of Ethiopia, Addis Ababa.*

Fredrick Masai Mustisya & Dr. Justus Kinoti(2019). Effect of Green Supply Chain Practices on Performance of Large Chemical Manufacturing Firms in Nairobi County Kenya. *Journal, International Chain, Supply Issn, Management*, *2*(2), 1–21.

Golicic, S. L., & Smith, C. D. (2013). A Meta–Analysis of Environmentally Sustainable Supply Chain Management Practices and Firm Performance. *Journal of Supply Chain Management,* 49(2), 78–95.

Gill, A. A., Shahzad, A., & Ramalu, S. S. (2019). Influence of Green Supply Chain Management Practices on Operational Performance : an empirical study amongst Pakistani Textile manufacturers. *Journal of Business Management and Accounting*, *9*(1), 55–72.

Janicke, M. (2008). Ecological modernisation : new perspectives. *Journal of Cleaner Production*, *16*(5), 557–565. https://doi.org/10.1016/j.jclepro.2007.02.011.

Karlsson, R., & Luttropp, C. (2007). Supply chain management and environmetal technologies role integration. *International Journal of Production R*, *45*(2), 401–423.

https://doi.org/10.1016/j.jclepro.2005.11.010.

Kenneth. W. G., Jr,Zelbst, P. J., Meacham, J., & Bhadauria, V. S. (2012). Green Supply Chain Management Practices. Impact on Performance. Supply Chain Manaement. *An International Journal*, *17*(3), 290–305. https://doi.org/10.1108/13598541211227126.

Luthra, S., Garg, D., Kumar, S. and Haleem, A, 2012, 'Implementation of the green supply chain management in manufacturing industry in India using interpretive structural modeling technique', BPR Technologia: *A Journal of Science, Technology & Management*, (1), 1–17

Lee Sang, M. and Sung Rhhajin, C. D. (2013). Pressures affecting green supply chain performance. *Management Decision*, *51*(8), 1753–1768. https://doi.org/10.1108/MD-12-2012-0841.

Mafini Ch and Loury Okoumba. (2018). Extending Green Supply Chain Management Activities to Manufacturing Small and Medium Enterprises in A Developing Economy of South Africa*Journal of Economic and Management Sciences,* 21(1), 1-12.

Mahmoud Seid. (2019). The Effect of Green Supply Chain Management Practices on Operational Perfromance: Benchmarking between shell and Cooperation petrolem company in Egypt. *International Journal of Supply and Operations Management*, *6*(1), 51–56.

Malhorta. (2007). *Marketing Research. An applied approach 5th edition. Prentice. Mekelle, mekelle university* (Issue October).

Mallikarathna, H. K. D., & Silva, C. W. C. (2019). The impact of green supply chain management practices on operational performance and customer satisfaction. *Proceedings of the International Conference on Industrial Engineering and Operations Management*, 2656–2667.

Muma, B. O., Nyaoga, R. B., Matwere, R. B., & Nyambega, E. (2014). Green supply chain management and environmental performance among tea processing firms in Kericho. *International Journal of Economics, Finanaces and Management Sciences*, *2*(5), 270–276. https://doi.org/10.11648/j.ijefm.20140205.11.

Mvubu , M. and Naude, M. J. (2016). Green supply chain management constraints in the South African fast-moving consumer goods industry : a case study. *Journal of Cotemporary Management*, *13*, 271–297.

Niemann, W., Kotze, T. and Adamo, F. (2016). Drivers and barriers of green supply chain management implementation in the Mozambican manufacturing industry. *Journal of Cotemporary Management*, *13*, 977–1013.

Ninlawan, C., Seksan, P., Tossapol, K., & Pilada, W. (2010). The Implementation of Green Supply Chain Management Practices in Electronics Industry. *In Proceedings of the International Multi Conference of Engineers and Computer Scientisits*, *3*, 17–19.

Ojo, E., Mbohwa, C., & Akinlabi, E. (2014). Green Supply Chain Management in Construction Industries in South Africa and Nigeria. *International Journal of Chemical, Environmental and Biological Sciences*, *2*(2), 146–150.

Ochieng, B. E. (2019). Effect of Green Purchasing Practices on Performance of Large Chemical Manufacturing Firms in Nairobi County Kenya*. Journal of International Business, Innovation and Strategic Management , 2(1), 1-13*. *2*(1), 1–12.

Santos, H., Lannelongue, G., & Gonzalez-benito, J. (2019). *Integrating Green Practices into Operational Performance : Evidence from Brazilian Manufacturers*. 1–18.

Sarkis, J., Gonzalez-torre, P., & Adenso-diaz, B. (2010). Stakeholder Pressure and the Adoption of Environmental Practices : The Mediating Effect of Training. *Journal of Operations Management*, *28*(2), 163–176. https://doi.org/10.1016/j.jom.2009.10.001.

Testa, F. and Iraldo, F. (2010). Shadowsand lights of green supply chain management. determinants and effect of this practicesbased on multinational study. *Journal of Cleaner Production*, *18*(10), 953–962.

Vanalle, R. M., Ganga, G. M. D., Godinho Filho, M., and Lucato, W. C. (2017a). Green supply chain management: An investigation of pressures, practices, and performance within the Brazilian automotive supply chain. *Journal of Cleaner Production,* 151, 250–259.

Waidyasekara, K. G. A. S., & Sandamali, R. L. N. (2012). Impact of Green Concept on Business Objectives of an organizations. *In proceedings of the world construction conferences of global challenges in construction industry, Colombo28-30, June2012* ,Colommo, CIO 364–374.

Yue, W &Chavez, R. (2014). Integrated Supply Chain Management and Pperational Perfromance. *An International Journal*, *19*(6), 683–696.

Zhu, Q., Geng, Y., Sarkis, J., & Lai, K. H., (2011). "Evaluation of Green Supply Chain Management among Chinese Manufactureres for Ecological Modernization Perspective". *Transportation Research Part E*,808-821.

Zhu, Q., and Liu, Q. (2010). Eco-design planning in a Chinese telecommunication network company: Benchmarking its parent company. Benchmarking. *An International Journal,* 17(3), 363-377.