

Green Supply Chain Management: A Step towards Clean and Green Future

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ABSTRACT: *Purpose:* To review the literature on increasing pollution, scarcity of resources, deterioration of environment and governing rules impacting the environment and economic performance to reduce the gap between stakeholders and GSCM.

Design methodology/approach: The literature from the authors on green practices, operations and environmental impacts is reviewed and the citation of green supply chain success factors from the different industries is accumulated in a tabulated form and merged to give critical success factors.

Findings: The paper combines the success factors from electronics, food and automobile industries to identify the critical and subcritical green supply chain factors for medium small enterprises.

Research limitations/implications: The results of this paper needs to be tested and validated as it is based on thorough literature review only.

Practical implications: There is scope for the researchers to test and validate the critical and subcritical green supply chain factors for small medium enterprises.

Originality/Value: The paper reviews the extant literature in Green Supply Chain Management discipline and combines the green supply chain factors from the different industries to bring forward the critical and subcritical factors for small medium enterprises which can provide for a strategic approach to many organizations to have a competitive advantage in local as well as global circuit.

KEYWORDS: Green Supply Chain Management, Lifecycle of a product, Critical Success Factors, Kyoto Protocol, Green Practices, Green initiatives.

Type: Review Paper

I. INTRODUCTION

Supply chain management is basically managing the flow of material from the raw material stage to the conversion into final products and also the delivery to the end-consumer. The responsibility of manufacturer was restricted till the delivery to the consumer however increasing awareness and responsibility towards the environment has added the role of the manufacturer in the post consumption phase as well [5]. Manufacturers are very much responsible for the increasing environmental pollution from sourcing to post consumption stage. The added social responsibility of the producer, the awareness towards increasing pollution and the current changing rules of the market has led to the addition of the green and environmental thinking into the basic supply chain. Thus, the concept of Green Supply Chain Management has been a very hot topic in the recent years which will give the existing supply chain a completely new face value. Zhu et al. Claimed GSCM can be regarded as an environmental innovation.[4]

According to Mr. Srivastava(2007), GSCM can be defined as integrating environmental thinking into traditional supply chain management which includes design of product, material sourcing and selection, manufacturing process, delivery of the final product to the consumers as well as end-of-life management of the product after its useful life (EOL management due to addition of GSCM)[6].

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GSCM = Green purchasing + Green manufacturing/materials management + Green distribution/marketing + Reverse logistics [1].

II. LITERATURE REVIEW

The green supply chain management has gained more interest among the researchers of the supply chain management. However, it is important to have information about what research has already been done in the green supply chain which will help us to come with the better suggestions to find out how it will actually affect the bottom line. The review of the previous literatures has been discussed as follows:

- a) The review paper “An Overview on Green Supply Chain Management in India” by NimavatDheeraj and Namdev Vishal shows that with the adoption of green practices there will be many benefits to an organization and allow them to have a competitive advantage. It also shows that Environmental Performance Index of India is very poor due to lack of awareness of Green Supply Chain Management so there is scope for working in this direction as well [1].
- b) In the article “Greening the Supply Chain Through Supply Chain Initiatives Towards Environmental Sustainability” Tareq et al. attempted to show the path and the various steps to be taken by the various business firms to make sustained environmental development. The paper investigated the adoption of green supply chain initiatives and the data was extracted from ISO 14001 certified firms through survey in Malaysia. The study also tells the four main drivers for the Malaysian companies to implement green practices which were regulations, customer requirements, expected business gains and social responsibility[2].
- c) The study by Dixit Garg, S. Luthra and A.Haleem in the article “Ranking of Performance Measures of GSCM towards Sustainability :Using Analytical Hierarchy Process” demonstrates the various performance measures useful for any organization. The five perspectives (Environment, Social, Economic, Operational& Cost) and nineteen performance measures were identified and ranked towards sustainability framework using Analytical Hierarchy Process. This paper made a benchmarking framework to take the difficult decisions related to GSCM for any firm to experience increase in benefits [3].
- d) The authors Noor Aslinda Abu Seman, NorhayatiZakuan, Ahmad Jusoh and MohdShokiMdArif in the paper “GREEN SUPPLY CHAIN MANAGEMENT: A REVIEW AND RESEARCH DIRECTION” have briefly reviewed the various literatures and has given a research direction framework for this emerging concept. The author has put emphasis on development of GSCM in developed and developing countries. The study also tells that there is scope for working towards the adoption and implementation of green supply chain management in Malaysia’s manufacturing industries.[4]
- e) The paper “Overview of Green Supply Chain Management: Operation and Environmental Impact at different stages of supply chain” by Rajesh Kumar and RiturajChandrakar focuses on the need for ecofriendly systems so as to reduce the deterioration of environment. The author writes by establishing long term relationships between buyer and supplier both environmental and economic performance can be improved. The author also attempts to study the optimization and implementation of the supply chain system. The paper also gives the importance about why GSCM is an important measure for the conserving the energy.[5]
- f) The article “Designing the green supply chain strategy for Indian Manufacturing firm” by Surajit Bag offers the Indian manufacturers an opportunity to appreciate the green perspectives of supply chain which can help to implement green supply chain strategy to have maximum benefits. The paper focuses on how to integrate the supply chain strategy with the traditional supply chain. The author has done thorough literature review, examined small, medium and large organizations who are implementing the GSCM in their practices and

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- provided a six step strategic approach for the implementation of green supply chain management. It also tells that the companies can have a sustained competitive advantage if they involve suppliers and third parties [6].
- g) “A Study of Success Factors in Green Supply Chain Management in Manufacturing Industries in Malaysia” by NorlindaMohdRozar, Wan Hasrulnizzam Wan Mahmood, Abdullah Ibrahim, Muhammad AshlyzanRazik showed that due to increasing environmental issues green supply chain is gaining momentum in Malaysia. The survey was carried to 241 out of 522 certified companies in Malaysia. The author found out that it is raw materials which is allowing companies to have a competitive advantage and only four firms have merged with the GSCM to meet the needs of the customers and the implementation of green supply chain initiatives [7].
- h) The paper on “Current status of Green Supply Chain Practices and Initiatives in the Indian SMEs: An Exploratory Study ” by Sarabjit Singh, ArwindBhardwaj identifies the various factors in the environment that affects the manufacturing sectors at the same time greens the traditional supply chain through survey questionnaire. The author focuses on the various activities involved in the supply chain system of Indian manufacturing firms and how much green they are in their activities taking into consideration the procurement, transportation and the distribution of raw materials [8].
- i) In the paper on “Application of Critical Success Factors in Supply Chain Management” by Mohamed SyazwanAbTalib, Abu Bakar Abdul Hamid the various success factors in supply chain management were reviewed. A total of 42 critical success factors’ studies related to supply chain management was obtained from the major databases. The major four critical success factors were identified from the literature survey were collaborative partnership, information technology, human resource and top management support. This paper will serve as a platform for for the further and future research on critical success factors [9].
- j) The author Ming-KueiChien in his article “Influences of green supply chain management practices on organizational sustainable performance” demonstrated how implementing the six step green supply chain strategies/practices will improve the organizations’ environmental, economic, social and sustainable performance through literature survey, interviews, questionnaire survey and after that analysis of the data collected. The study also demonstrates the various environmental protection standards. This research discusses the Taiwan’s electronics and electrical industries by considering the green standards for green supply chain practices for sustainability in organizations[10].
- k) The paper “Barriers to implement green supply chain management in automobile industry using interpretive structural modeling technique-An Indian perspective” by Sunil Luthra, Vinod Kumar, Sanjay Kumar, AbidHaleem aims to develop a structural model of the barriers for implementation of green supply chain management in Indian Automobile Industry. 11 barriers were identified which were later classified on the basis of dependence and driving power. The removal of the barriers is also suggested in this paper[11].
- l) The study conducted by JavadSoroor and RaminGorjian in Faradast Energy Falat CO. “An Analysis of Key Success Factors of Green Supply Chain Management” analyzed the key success factors in Green Supply Chain Management and then the main five most important factors in successful GSCM were ranked. The sample size was 40 and from the Morgan table they were randomly selected. The 27 factors were identified after literature survey and interview with the experts which were later on divided into 6 main categories. However, all the factors belonged to environmental management class which arecommitment from senior management, commitment from middle management, ISO 14001 Certification, cooperation to improve the environment, and comprehensive environmental quality management [12].
- m) The article on “An Integrated Framework of Green Supply Chain Management Implementation” by M. Ghobakhloo et al. gives us a framework of green supply chain process implementation and the activities involved in greening the supply chain based on the previous available literatures[13].

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- n) The authors MahsaPishdar et al. in “Development of factors effective in the success of Green Supply Chain Management” tells us that the approach towards green supply chain and the driving factors have an effect on the efficiency of the supply chain. The DEMATEL method was used and three effective factors from the cause group were environmental rules, green designing and green purchasing. However, those from the effect group were the components and environmental efficiency [14].
- o) The paper on “Positive Influence on Green Supply Chain Operations on Thai Electronic Firms’ Financial Performance” by K.Y. Tipayyawong, T. Tiwaratreewit, A. Sopadang shows the relationship between GSCM practices and financial performance of Thai electronics firm. From a total of 50 respondents, after analysis the main influencing factors were green manufacturing, green logistics and green sourcing. Cost and complexity were identified to be the major barriers [15].
- p) The author Joseph Sarkis in his article “A strategic design framework for green supply chain management” has given a strategic design framework that will help taking decisions in the favor of green supply chain management. The paper throws light on the components and elements of the green supply chain and how they impact each other [16].
- q) The paper on “A Conceptual framework on green supply chain management practices” by B. L.Lakshmimeera, DrChitramaniPalanisamy has given a framework which can be modified and applied to any of the supply chains[17]. It can also be used to measure their position and measure their competitive advantage with respect to the competition in the market. It can serve as guidelines for the researchers to apply the concepts practically.

Table 1 shows the literature review of the previous articles related to green supply chain management by the various authors in the different countries.

Table 1.SUMMARY OF THE PREVIOUS STUDIES OF THE GREEN SUPPLY CHAIN MANAGEMENT

Serial No.	Author	Objective	Findings
1.	NimavatDheeraj, Namdev Vishal	To discuss the overview of Green Supply Chain Management in India.	Due to lack of awareness of Green supply chain management, the Environmental performance index ranking of India is poor.
2.	Tareq Al Khidir, Dr.SuhaizaHanimMohama dZailani	To enhance the capabilities of green supply chain management through sustainability.	The literature discussed the steps to be taken by business organizations through green supply chain to make sustainable development a reality.
3.	Dixit Garg, S. Luthra, A. Haleem	To identify performance measures and ranking of these performance measures of GSCM performance measurement towards sustainability framework.	This paper identifies the GSCM performance measures and further these performance measures are ranked with respect to five perspectives being Environment, Economic, Social, Operational and Cost.
4.	Noor Aslinda Abu Seman, NorhayatiZakuan, Ahmad Jusoh and MohdShoki MdArif(2012)	To discuss an overview of the development of GSCM literature in a developed countries and developing countries.	The literature discussed the GSCM implementation includes drivers, practices, and performance over the world.

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5.	Rajesh Kumar, RiturajChandrakar	Operation and Environmental Impact at different stages of the Green Supply Chain.	GSCM is inevitable if the Earth is to be kept green and appropriate methodology may be adopted by the industries/services to minimize the detrimental effect on the environment.
6.	Surajit Bag	To develop green supply chain for Indian manufacturing firm.	Organizations must have a holistic approach for successful implementation of GSCM.
7.	NorlindaMohdRozar, Wan Hasrulnizam Wan Mahmood, Abdullah Ibrahim, Muhammad AshlyzanRazik	To study the success factors in GSCM in manufacturing firms in Malaysia.	The GSCM practices are being adopted by various firms as it is gaining momentum in Malaysia and it is raw materials which is helping them to have a competitive advantage in the market.
8.	Sarabjit Singh, ArwindBhardwaj	To study the various activities involved in GSCM for Indian manufacturing firms and to find how much eco-friendly they are in their logistics as well as supply chain activities.	The literature brings forward the environmental factors affecting the manufacturing sectors while greening the supply chain as identified from the literature review.
9.	Mohamed SyazwanAbTalib, Abu Bakar Abdul Hamid	To review the critical success factors in supply chain management and identify the important and major critical success factors in the supply chain management.	The study identifies major supply chain critical success factors such as collaborative partnership, information technology, human resource and top management support as the major critical success factors in supply chain management.
10.	Ming-KueiChien	To determine the influences of green supply chain management practices on organizational sustainable performance.	The strategies for green design ,innovation, manufacturing, purchasing, services practices are GSCM which will positively affect the economic, environmental, and social performances of a certain organization.
11.	Sunil Luthra, Vinod Kumar, Sanjay Kumar, AbidHaleem	To develop a structural model of the barriers for implementation of green supply chain management in Indian Automobile Industry.	The barriers are identified are listed in the category of dependent variables, driver variables and linkage variables. The removal of these barriers is also suggested in this paper.
12.	JavadSoroor, RaminGorjian	To identify and prioritize the key success factors in green supply chain management.	The top five success factors of GCSM are commitment from senior management, commitment from middle management, ISO 14001 Certification, cooperation to improve the environment, and comprehensive environmental quality management.
13.	M.Ghobakhloo, S.H. Tang, N. Zulkifli, M.K.A.Ariffin	To present an integrated framework of GSCM process implementation.	The paper brings forward the framework of green supply chain process implementation and the activities involved in greening the supply chain

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14.	MahsaPishdar, Mohammad RezaSeyyedHashemi Toulon,SimaZamani, FereshtehFarzianpur	To study the development of factors that are effective in the success of Green Supply Chain Management.	Three effective factors from the cause group were found to be environmental rules, green designing and green purchasing and those from the effect group were the components and environmental efficiency.
15.	K.Y.Tipayyawong,T.Tiwar atreewit, A. Sopadang	To study the correlation between GSCM practices and financial performance.	The main influencing factors were identified to be green manufacturing, green logistics and green sourcing. Cost and complexity were identified to be the major barriers.
16.	Joseph Sarkis	To develop a strategic design framework for green supply chain management.	The paper gives a strategic framework that will help taking decisions in the favour of green supply chain management. The paper throws light on the components and elements of the green supply chain and how they impact each other.
17.	B.L.Lakshmimeera, DrChitramaniPalanisamy	To develop a framework for green supply chain management.	The framework consolidated is in generalized form and can be modified to any supply chain.

2.1 Kyoto protocol

The surface temperature of the earth has considerably increased due to global warming. The anthropogenic gases due to industrialization are one of the main reasons for the climatic change and hence, the global warming. Kyoto Protocol was signed in 1997 as a response to increasing temperature and the global warming. However, it came into effect in 2005 [19]. The main principle is “common but differentiated responsibilities” that all countries should reduce the green house (GHG) gas emissions. The developed countries should put more efforts while the developing should share the less of the burden. The treaty in its first tenure (2008-2012) aimed to reduce the global gas emissions by the industrialized nations to 5.2% as of 1990 level under legally binding conditions. The second period (2013 to 2020) aims to reduce the emissions as of 2005 levels by 2020. Every country who has signed the treaty is given a quota or a specified limit above which it cannot produce GHG emissions. If any country exceeds the limit, the three mechanisms to reduce the GHG emissions offered by the Kyoto protocol are as follows:

- (a) **Emission trading:** In order to escape from penalty, the country who has exceeded the limit can buy carbon units from another country who is within the limit so that the total allowance remains the same.
- (b) **Clean development mechanism:** In this one annex 1 country provides financial aid or technology to reduce the carbon dioxide emissions to one non annex country.
- (c) **Joint implementation:** In this, both the annexure1 countries are involved. the country who has exceeded the limit takes emission reduction projects in other industrialized country so that the units increase in emission can be balanced by reducing the emission in another industrialized country.

India is one of the major markets for investing in clean development mechanism whereas annex 1 countries are investing in India to escape form the penalty. India ranked 6 in the emission of the carbon dioxide. The GHG emissions are increasing at the rate of 4.6% per year compared to a 2% average [21].14.7% of the total clean development mechanism projects are invested in India. India has also ratified for the second phase commitment so now it will be

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binding on developed nations to reduce the GHG emissions. India in the long phase is going to be benefitted by participating in the Kyoto protocol.

2.2 Life Cycle of a product

The basic processes involved in the life cycle of a product are procurement of raw materials, manufacturing, transportation, utilization, end of life management and then again procurement and the cycle continues [20]. The first step towards sustainability can only be taken if the picture is clear in our mind that even if our focus is to maximize profits but it should not be at the cost of the nature. In all of the above mentioned phases, the main focus is on carbon off setting. The step towards environment will not only help us reducing GHG emissions and global warming but also have a competitive advantage.

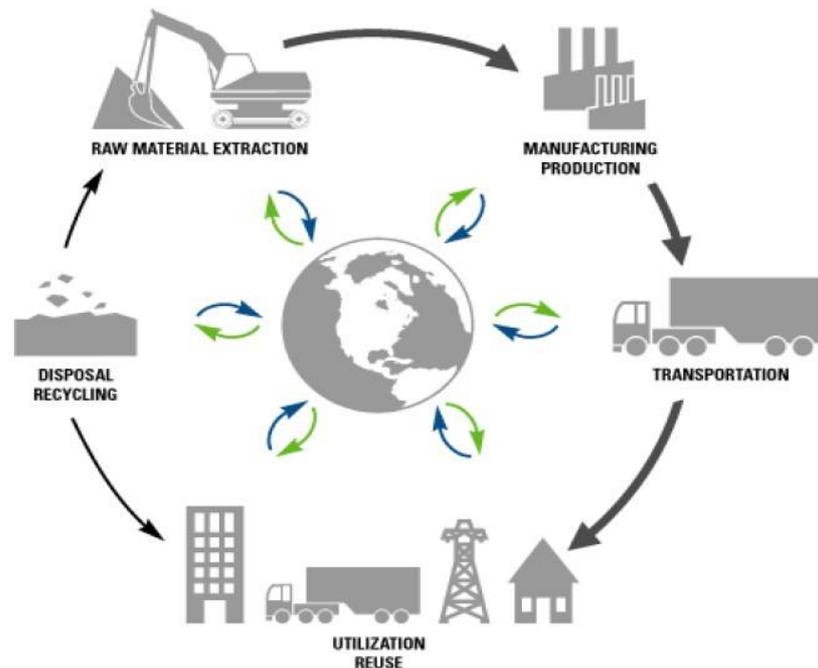


FIG: Stages involved in the lifecycle of a product (National Institute of Standards and Technology's Manufacturing Engineering)

One also maintains the ecofriendly perspective, by focusing on End of Life management i.e. recycle, reuse, recover. By making use of 3R concept, one is not only able to reduce GHG emissions but also helping in the conservation of precious natural resources also at the same time reducing investment and pollution. After the end of life management, the process again comes to first phase and the cycle continues.

2.3 Green Supply Chain and Value Delivery

The Value chain helps in adding the value to the existing product. The value chain consists of two sections, viz. Primary activities and Support activities[18]. Primary activities are directly associated with the creation, maintenance, sales, service, etc. However, the Support activities are just to give support to the primary activities.

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The Primary activities consists of Inbound logistics, Operations, Outbound logistics, Marketing & sales and the service. The inbound logistics has relation with distribution and storage of goods internally. Increased cube utilization reduces the wastage of empty trailer space and reduced in house traffic movements. The Operations help in creating the value as they convert the inputs into outputs. Fuel efficient machinery, solar systems, reverse logistics, collecting material for reuse, returnable and reusable packaging help in improved fuel efficiency, waste management and reduced solid waste. Design for environment and carbon offsetting reduces the toxic emissions at plant. Outbound logistics is concerned with the distribution and storage externally for the delivery of the product.

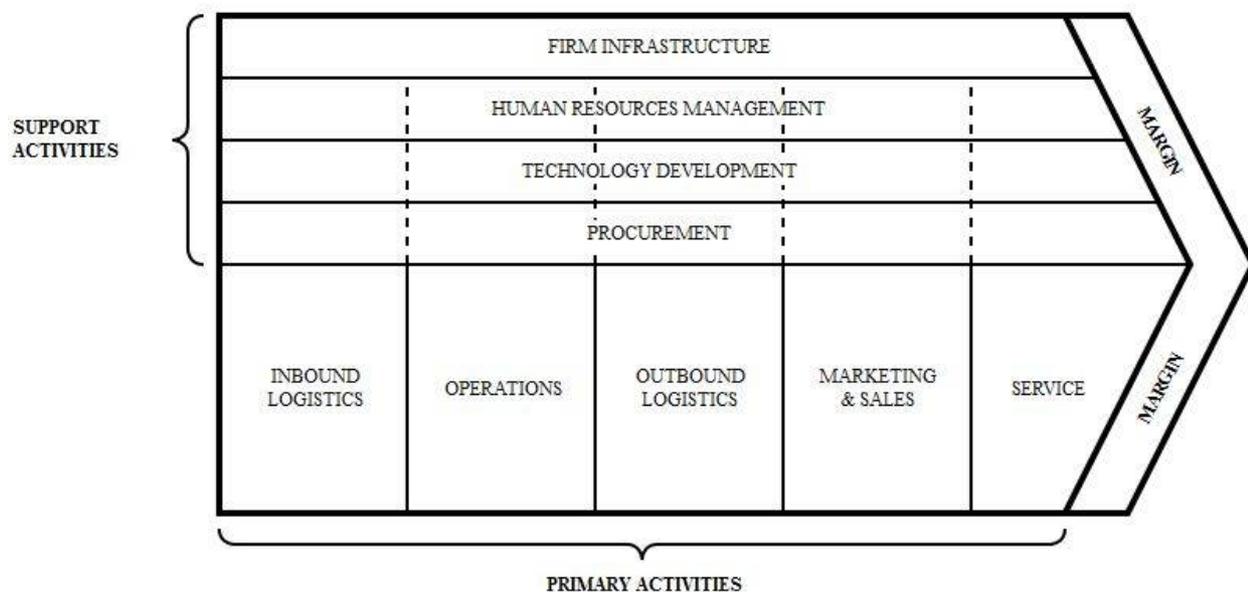


FIG: Porter's Value Chain[18]

Strategically placing the warehouses and distribution centres, optimizing the routes reduces the carbon emissions due to reduced miles and improved transportation. Keeping a track on whether the goods delivered on time and maintaining good relations with the new and old customers and ensuring that complaints are handled is a key factor in the marketing and sales. The role of service arises after post-sale phase to conserve the value of the product[18].

The Support activities are concerned with the procurement, technological development, human resource management and firm infrastructure. Procurement is concerned with the raw materials need to be purchased to have an advantage in the market. Localized sourcing for just in time, substitute for hazardous material, auditing suppliers for green supply and sharing data for green initiatives help in cost reduction benefits from suppliers' improved efficiency. Human resources management keeps focus on what manpower needs to be hired and skilled which will help creating value. It is related to the training, motivation, encouragement, monitoring the percentage of the employees trained and needed for the future, performance appraisal and finding out the non-compliance problem of the employees. The Technological Development has to be updated with the technological advances going on at the same time trying to develop innovative processes which also helps in corporate image improvement and brand image building. The firm infrastructure help in the smooth functioning of the operations. The administrative, legal and accounts are the systems used by the various organizations to have advantage in the market. A holistic approach, organizational learning, working with suppliers on green supply chain guidelines helps in improving firm's competitiveness, increased market share due to improved image and reduction in environmental risks[18].

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The green supply chain management (GSCM) provides a very systematic approach for any company to gain advantage over its competitors by affecting the improvements in the extraction of raw materials to the disposal of final goods thereby helping in achieving plan success.[4] Most of the companies are more interested in knowing how it will affect the bottom line rather saving the environment. The green supply chain management (GSCM) has become increasingly important for Indian manufacturers due to increasing awareness among the producers to corporate social responsibility and the need to cope with the environmental policies and norms. The green supply chain management has become an integral part of a company's various processes in a supply chain[5].

III. GREEN SUPPLY CHAIN SUCCESS FACTORS

After reviewing the literature thoroughly from the given below research papers, the success factors from the various literatures of electronic industry, food industry and automobile industry were identified. The same in a tabular format is given below after the information regarding journal, author and year is given below in a table:

Serial No.	Author	Topic	Journal
1.	JavadSoroor,RaminGorgjian	An Analysis of Key Success Factors of Green Supply Chain Management(Case Study: Faradast Energy Falat Co.)	Sorooret <i>al.</i> , Int. J. Rev. Life. Sci., 5(10), 2015, 977-984, ISSN 2231-2935
2.	NorlindaMohdRozar, Wan Hasrulnizzam WanMahmood, Abdullah Ibrahim, Muhammad AshlyzanRazik	A Study of Success Factors in Green Supply Chain Management in Manufacturing Industries in Malaysia	Journal of Economics,Business and Management, Vol.3, No.2,February 2015.
3..	Walter NdegeMachogu	FACTORS INFLUENCING THE ADOPTION OF GREEN SUPPLY CHAINMANAGEMENT STRATEGY IN INDUSTRIES: A CASE OF DELMONTE COMPANY	International Journal of Social Sciences and Project Planning Management, 1 (2),2014.
4.	Yan Li	Research on Performance Measurement of Green Supply ChainManagement in China	Journal of Sustainable Development, Vol. 4, No. 3; June 2011
5.	Sarabjit Singh, ArvindBhardwaj	Current Status of Green Supply Chain Practices and Initiatives in the Indian SMEs: An Exploratory Study	International Journal of Engineering, Business and Enterprise Applications (IJEBEA)
6.	Dixit Garg, S. Luthra,A.Haleem	Ranking of Performance Measures of GSCM	International Journal of Social, Human Science and

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		towards Sustainability :Using Analytical Hierarchy Process	Engineering, Vol.8 No.3, April 2014.
7.	Ming-KueiChien	Influences of green supply chain management practices on organizational sustainable performance	International Journal of Environmental monitoring and protection, Vol.1, No.1, 2014, pp12-23
8.	Qinghua Zhu	Green supply chain management in leading manufacturers: Case studies in Japanese large companies.	Management Research Review, Vol.33 Iss 4 pp380-392
9.	MahsaPishdar, Mohammad Reza SeyyedHashemiToloun, SimaZamani, FereshtehFarzianpour	DEVELOPMENT OF FACTORS EFFECTIVE IN THE SUCCESS OF GREEN SUPPLY CHAIN MANAGEMENT	American Journal of Agricultural and Biological Sciences 9(1) : 33-43, 2014
10.	Sumeet Gandhi, Sachin Kumar Mangla, Pradeep Kumar, Dinesh Kumar	Evaluating factors in implementation of successful green supply chain management using DEMATEL: A case study	International Strategic Management Review 3, 2015 96-109
11.	Victor Guang Shi and SclennyKoh, FamesBaldwin, FedericaCucchiella	Natural resource based Green Supply Chain Management	Supply Chain Management: An International Journal
12.	AzmawaniAbdRahman, Joann Ho, KhairulAnuarRusli	Pressures Green Supply Chain Management practices and performance of ISO 14001 certified manufacturer in Malaysia	International Journal of Economics and Management (2014)
13.	Dr Howard Frederick, JensElting	Factors affecting green SCM in New Zealand Food and Beverage Sector	Anzam 2010
14.	Qinghua Zhu, Joseph Sarkis	Relationships between operational practices and performance among early adopters of green supply chain management practices in Chinese manufacturing enterprises	Journal of Operation Management (2004)
15.	A.M.A. El Saadany, M.Y Jaber, M.Booney	Environmental performance measures	A.M.A. El Saadany, M.Y. Jaber, M. Bonney, (2011)

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		for Supply Chain	"Environmental performance measures for supply chains", Management Research Review, Vol. 34 Iss: 11, pp.1202 – 1221
16.	PurbaRao,Diane Holt	Do Green Supply Chain lead to competitiveness and economic performance	International Journal of Operations and Production Management
17.	K.Y Tippayawong,T.Tiwaratreewit, A Sopadang	Positive influence of Green Supply Chain Operations on Thai Electronics firms Financial Performance	Procedia Engineering 118 (2015)
18.	Ram Bhoor,M.S. Narwal	An Analysis of Drivers affecting the implementation of green supply chain management for the Indian manufacturing industries	International Journal of Research in Engineering and Technology
19.	Su Yol Lee	Drivers for the participation of small and medium sized suppliers in green Supply Chain initiatives	Supply Chain Management: An International Journal, Vol 13
20.	Ninlawan C., Seksan P., Tossapol K., and Pilada W.	The Implementation of Green Supply Chain Management Practices in Electronics Industry	Preceding of the International MultiConference of Engineers and Computer Scientists 2010 Vol III, IMECS 2010, March 17-19, 2010, Hong Kong
21.	HamidehShekari, SkandarShirazi, Mohamad Ali Afshari, Said Mehdi Veyseh	Analyzing the key factors affecting the green supply chain management: A case study of steel industry	Management Science Letters ISSN 1923-9343 (Online) - ISSN 1923-9335 (Print) Quarterly Publication Volume 1 Issue 4 pp. 541-550 , 2011
22.	SashiSekharParamanik, Surjit Kumar Kar	Green Technology performance measures using BSC-DEA approach	The IUP Journal of Knowledge Management, Oct 2013.
23.	NimawatDheeraj, NamdevVishal	An Overview of Green Supply Chain Management in India	Research Journal of Recent Sciences ,ISSN 2277-2502 Vol. 1(6), 77-82, June (2012) Res.J.Recent Sci.
24.	Joseph Sarkis	A strategic decision framework for green	Journal of cleaner production 11(2013)

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		supply chain management	
25.	ToshiH.Arimura, Nicole Darnall, Hajime Katayama	Is ISO 14001 a gateway to more advanced voluntary action? The case of green supply chain management	Journal of Environment Economics and Management 61 (2011)
26.	Qinghua Zhu, Yong Geng, Tsuyoshi Fujita, Shizuka Hashimoto	Green Supply Chain Management in leading manufacturers	Management Research Review, Vol.33 Iss4 pp.380-392
27.	Surajit Bag	Designing the Green Supply Chain strategy for Indian Manufacturing firm	Journal of Supply Chain Management system
28.	Tareq Al Khidir, DrSuhaizaMohamadZailani	Greening of the Supply Chain through Supply Chain initiatives towards environmental sustainability	Department of Business Studies, Marketing and E-Business Section, Salalah College of Technology, Oman and School of Management, Universiti Sains Malaysia
29.	A.Kamol Kittiwong, B.Phrukashphanrat	An Analysis of Drivers affecting Green Supply Chain Management implementation in Electronic Industry in Thailand	Journal of Economics Business and Management Vol 3, No 9, Sept 2015
30.	James EduPeprah, Isaac Opoku-Fofie, KwabenaNduro	Factors influencing green supply chain in the mining sector in Ghana	European Journal of Logistics, Purchasing and Supply Chain Management Vol.4, No1, pp.32-50, February 2016

Electronics Industry	Food Industry	Automobile Industry
Internal Environmental Audits [1,5,11,14,20]	Supplier evaluation and selection [4,5,11,16,29]	Commitment from the top management [1,2,4,10,29]
Supplier evaluation and selection [4,5,11,16,29]	Internal Environmental Audits [1,5,11,14]	Green purchasing [1,4,5,7,8,9,11,12,18,26,28]
Cooperation with customers [1,2,4,8,9,12,18,26,28]	Green Purchasing [1,3,4,5,7,8,9,11,12,18,26,28]	Training employees [2,10]
Commitment from the top management [1,2,4,10,20,29]	Operational performance [6,8,9,11,24,27]	Government regulations and legislations [7,8,9,10,18,19,29]
Green purchasing [1,4,5,7,8,9,11,12,17,18,20,26,28]	Government regulations and legislations [3,7,8,9,10,18,19,29]	Supplier evaluation and selection [4,5,11,16,29]
Reverse logistics [1,9,10,12,17,20,21,27,29]	Commitment from the top management [1,2,3,4,10,13,29]	Eco-friendly design [1,4,8,9,11,14,17,26]
Ecofriendly packaging [1,11,17]	Process auditing [1,3,14,15]	Environmental management systems [1,6,8,11,14,25,26]

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Government regulations and legislations [7,8,9, 10,18,19,29]	Pre-shipment inspection [3,4,5,10,16,22]	Lifecycle management [1,3, 9,10,12,17,20,21,27,29]
Green Manufacturing and product recovery [1,5,11,14]	Environmental Management systems [1,6,8,11,14,20,25,26]	Social performance [6,18,28]
IT support systems [1,7,11,16,18,22,27]	Green Manufacturing and product recovery [1,5,11,14]	Operational performance [6,8,9,11,20,24,27]
Process auditing [1,14,15,20]	Ecofriendly packaging [1, 11,17]	Competitiveness [10,13, 18,29]
Pre-shipment inspection [4,5,10,16,22]	Waste Management [11,16,18,27]	Organization involvement [2,10,15,16,30]
Transportation and distribution[1,4,5,11,15,17,20]	Organization Strategy [3,13,27]	Investors and Stake holder pressure [7,18,22,29]
Increasing the cube utilization of the products [1,5,11,14,15]	Training employees[2,3,10]	Process Auditing [1,14,15]
Strategically placing the warehouses [1,5,15, 17,20,27]	Transportation and distribution [1,4,5,11, 15,17]	Performance appraisal [2, 3,10,16,18,30]
Training Employees [2,10]	Increase the cube utilization of products [1,5,11,14,15]	Green Manufacturing and product recovery [1,5,11,14]
Waste Management [11,16,18,27]	Reverse logistics [1,3,9, 10, 12,17,21,27,29]	Organization Strategy [13,27]
Organization involvement [2,10,15,16,20,30]	Performance appraisal [2, 3,10,16,18,30]	IT support systems [1,7,11, 16,18,22,27]
Environmental management systems [1,6,8,11,14,25,26]	Competitiveness [10,13, 18,29]	Waste Management [11,16,18,27]

The factors from the different industries were then merged to give subcritical success factors for small medium enterprises. The 35 green supply chain subcritical success factors were formed. The success factors important from the green perspective for the supply chain management after thorough perusal by different authors from the various literatures and citation has been given below.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	TOTAL		
Commitment from the top management	✓	✓	✓	✓																											8		
Green Purchasing	✓	✓	✓	✓																												15	
Cooperation with the customers	✓	✓	✓	✓																												11	
Internal Environmental audits	✓				✓																											5	
Government regulations and legislations																																8	
Training employees		✓	✓																													3	
Eco-friendly packaging	✓																															3	
Reverse Logistics	✓			✓																												10	
Eco-friendly design	✓																															9	
Supplier evaluation and selection																																5	
Cooperation with the suppliers	✓																															7	
Environmental management systems	✓																															8	
Investment recovery																																5	
Economic performance																																4	
Environmental performance	✓																															10	
Social performance																																3	
Operational performance																																7	
Competitiveness																																4	
Employee involvement			✓																													4	
Audit Suppliers for green SCM																																5	
Awareness programs			✓	✓	✓																											7	
Transportation and Distribution	✓																															7	
Encouragement for employees			✓	✓	✓																											6	
Investors and stake holder pressure																																4	
Process auditing	✓																															5	
Preshipment inspection			✓	✓	✓																												6
Increasing the cube utilization of the products	✓																															4	
Green Manufacturing and product recovery	✓																															8	
Strategically placing warehouses	✓																															8	
Logistics	✓																															8	
Organization strategy				✓																												4	
Programs to promote and track the reduction of waste	✓																															5	
Performance appraisal of the employees			✓	✓																												6	
Waste Management																																4	
TOTAL	17	7	11	8	11	5	5	9	8	12	16	5	4	11	5	8	7	11	2	17	2	2	2	2	1	6	8	2	7	5			

TABLE: CITATION OF SUCCESS FACTORS FROM DIFFERENT LITERATURES

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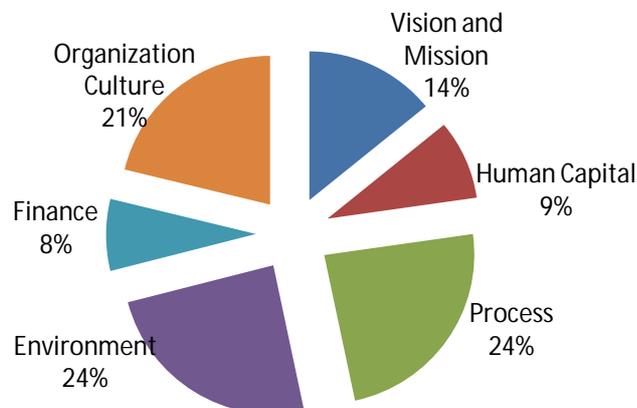


RADAR CHART: CITATION OF SUCCESS FACTORS FROM DIFFERENT LITERATURES

IV. MERGING OF SUB CRITICAL SUCCESS FACTORS

The 6 main critical success factors were then formed for the small medium enterprises viz., Vision and Mission, Human Capital, Process, Finance, Environment and Organization Culture from the 35 subcritical success factors.

CSFs for SMEs

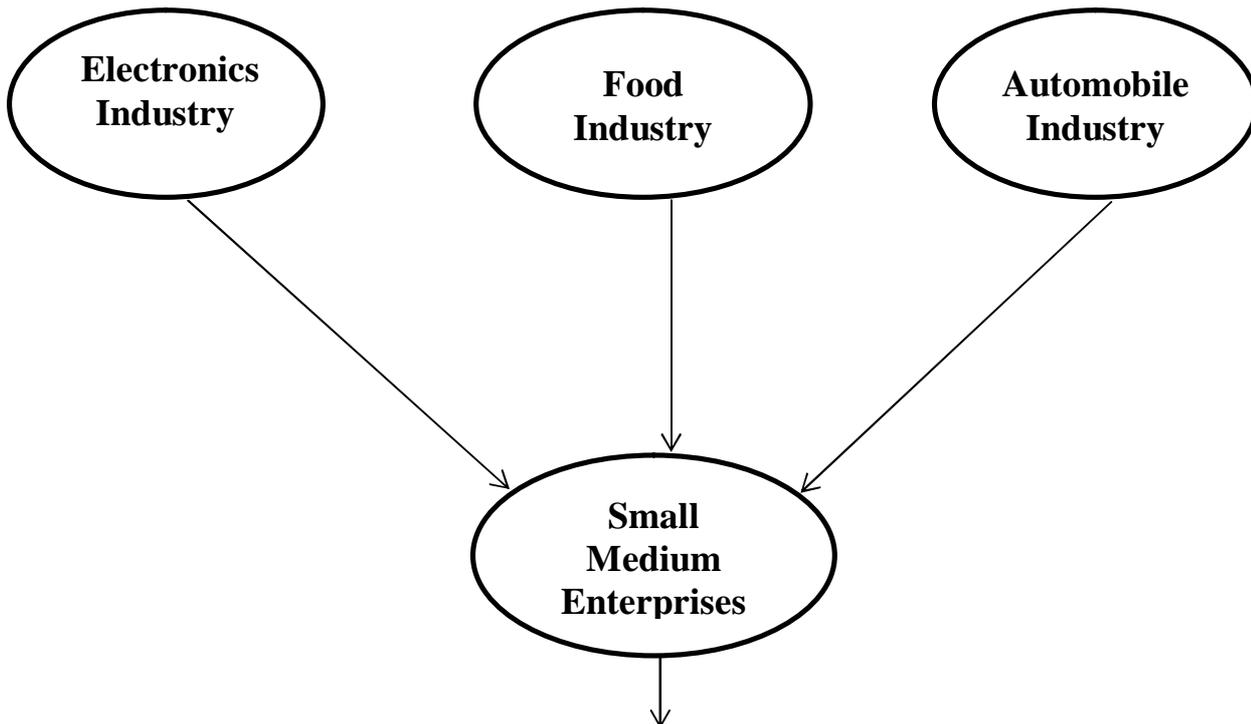


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Vision & Mission	Human Capital	Process	Finance	Environment	Organization Culture
<ul style="list-style-type: none"> • Commitment from the top management • Internal Environmental Audits • Environmental Management Systems • Safety Committees & Recycling programs • Competitiveness • Supplier evaluation & selection 	<ul style="list-style-type: none"> • Training employees • Awareness programs • Encouragement for employees • Employee involvement • Performance appraisal of the employees • IT support systems 	<ul style="list-style-type: none"> • Green Manftg & product recovery • Process auditing • Preshipment inspection • Increasing the cube utilization of the products • Strategically placing the warehouses • Transportation & Distribution 	<ul style="list-style-type: none"> • Partnership with green organization & suppliers • Government regulations & legislations • Investment Recovery • Keeping documents uptodate • Investors & Stake holder pressure 	<ul style="list-style-type: none"> • Design for environment • Ecofriendly design & packaging • Reverse logistics • Recycling programs • Waste Management • Substitute for hazardous material 	<ul style="list-style-type: none"> • Social commitment and participation • Safety Committee and Recycling programs • Organization involvement • Audit Suppliers for green SCM • Social performance • Solving non-compliance problems

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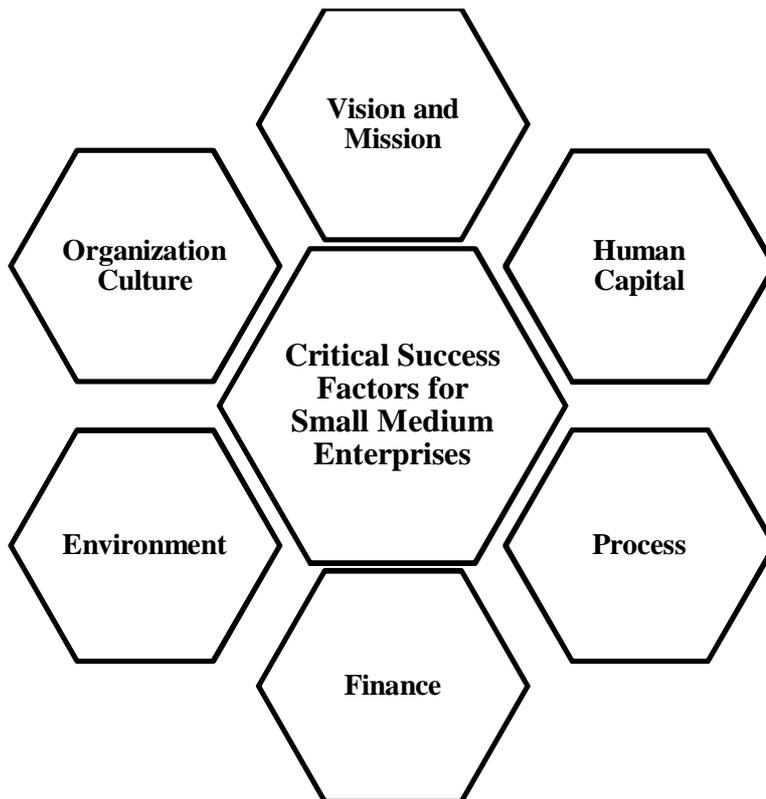


FIGURE : Merging of Critical Success Factors for Small Medium Enterprises from different industries.

V. RESEARCH DIRECTION

Previously, the research has been conducted in the direction of greening the supply chain towards environmental sustainability, the framework, the initiatives and the various practices that can be adopted by the firms. There are many studies showing reasons for adopting the GSCM however they do not cover all the contents related to green supply chain management and the literature for eco-friendly supply chain is limited. In big organizations, the top management and stake holders may have a different thinking towards GSCM as they both are interested in the profit making and may find GSCM, a hindrance in their organization's success path. Moreover, our focus is on big organizations but what about the small ones. They are also in the race to make profit, they are exploiting the resources, they are also deteriorating the environment. The successful execution of the strategy have varied from organization to organization. There is scope for study on why small enterprises are not able to implement GSCM, the factors for adoption and the initiatives to be taken. There is also scope for the researchers to identify, test and validate the critical success factors associated with the organizations to have more knowledge about influence of GSCM on business performance which will help them to have a competitive advantage.

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VI. CONCLUSION

The Green Supply Chain Management, in spite of having its existence in late 90s the Environmental Performance Index(EPI) of India is worst. Green Supply Chain Management combines the traditional supply chain with the environment friendly perspective but the proper designing of policies require correct understanding of obstacles and steps towards sustainability to slacken issues related to environment. Thus, the combination of improved strategies of production and ecofriendly concept keeping in mind the critical success factors to produce the goods and services can provide for a strategic approach to many organizations to have a competitive advantage in local as well as global circuit. However, there is scope for study on development and the formulation of models to find out the impact of critical success factors on the green supply chain management.

REFERENCES

- [1] NimavatDheeraj, Namdev Vishal "An Overview of Green Supply Chain Management in India" *Research Journal of Recent Sciences Vol.1(6),77-82, June 2012.*
- [2] Tareq Al Khidir, Dr.SuhaizaHanimMohamadZailani"Greening the Supply Chain Through Supply Chain Initiatives Towards Environmental Sustainability",2007.
- [3] Dixit Garg, S. Luthra and A.Haleem in the article "Ranking of Performance Measures of GSCM towards Sustainability :Using Analytical Hierarchy Process" *International Journal of Social, Human Science and Engineering, Vol.8 No.3, April 2014.*
- [4] Noor Aslinda Abu Seman, NorhayatiZakuan, Ahmad Jusoh and MohdShoki MdArif(2012) "Green Suply Chain Management: A Review and Research direction".*International Journal of Managing Value and Supply Chains (IJMVSC) Vol. 3, No. 1, March 2012.*
- [5] Rajesh Kumar, RiturajChandrakar "Overview of Green Supply Chain Management: Operation and Environmental Impact at Different Stages of the Supply Chain" *International Journal of Engineering and Advanced Technology (IJEAT) ISSN: 2249 – 8958, Volume-1, Issue-3, February 2012.*
- [6] Surajit Bag "Designing the green supply chain strategy for Indian Manufacturing firm" *Journal of Supply Chain Management Systems, Vol.3, Issue 1, January 2013.*
- [7] NorlindaMohdRozar, Wan Hasrulnizzam Wan Mahmood, Abdullah Ibrahim, Muhammad AshlyzanRazik "A Study of Success Factors in Green Supply Chain Management in Manufacturing Industries in Malaysia" *Journal of Economics, Business and Management, Vol.3, No.2, February 2015.*
- [8] Sarabjit Singh, ArvindBhardwaj "Current Status of Green Supply Chain Practices and Initiatives in the Indian SMEs: An Exploratory Study" *International Journal of Engineering, Business and Enterprise Applications (IJEBA), ISSN-2279-0039.*
- [9] Mohamed SyazwanAbTalib, Abu Bakar Abdul Hamid "Application of Critical Success Factors in Supply Chain Management" *International Journal of Supply Chain. Mgt Vol. 3, No. 1, March 2014.*
- [10] Ming-KueiChien "Influences of green supply chain management practices on organizational sustainable performance" *International Journal of Environmental Monitoring and Protection 2014; 1(1): 12-23. April 10, 2014.*
- [11] Sunil Luthra, Vinod Kumar, Sanjay Kumar, AbidHaleem "Barriers to implement green supply chain management in automobile industry using interpretive structural modeling technique-An Indian perspective" *Journal of Industrial Engineering and Management. JIEM, 2011-4(2); 231-257.*
- [12] JavadSoroor, RaminGorjian"An Analysis of Key Success Factors of Green Supply Chain Management" *International Journal of Review in life Sciences, 5(10), 977-982 ISSN 2231-2935, 2015.*
- [13] M.Ghobakhloo, S.H. Tang, N. Zulkifli, M.K.A.Ariffin "An Integrated Framework of Green Supply Chain Management Implementation" *International Journal of Innovation, Management and Technology, Vol.4, No.1, February 2013.*
- [14] MahsaPishdar, Mohammad Reza SeyyedHashemi Toulon, SimaZamani, FereshtehFarzianpur "Development of factors effective in the success of Green Supply Chain Management" *American Journal of Agricultural and Biological Sciences 9(1): 33-43, 2014.*
- [15] K.Y. Tipayyawong, T. Tiwaratreewit, A. Sopadang "Positive Influence on Green Supply Chain Operations on Thai Electronic Firms' Financial Performance" *Procedia Engineering 118 (2015) 683-690.*
- [16] Joseph Sarkis" A strategic design framework for green supply chain management" *Journal of cleaner production 11 (2013)397-409.*
- [17] B. L.LakshmiMeera, DrChitramaniPalanisamy "A Conceptual framework on green supply chain management practices" *Industrial Engineering Letters ISSN 2224-6096, Vol.3, No.10, 2013.*
- [18] Michael Porter, The value chain from competitive advantage. http://people.tamu.edu/~v-buenger/466/Value_Chain.pdf
- [19] Kyoto Protocol to the United Nations Framework Convention on Climate Change.
- [20] Aida Sefić Williams, "Life Cycle Analysis (LCA)" *Illinois Sustainable Technology centre, TN13-098, May 2013.*
- [21] Shreekant Gupta, "Implementing Kyoto-type Flexibility Mechanisms for India : Issues and Prospects", *Centre for Development Economics, Working paper no.117, April 2003.*