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GREEN SUPPLY CHAIN MANAGEMENT PRACTICES IMPLEMENTATION AND EFFECT ON ORGANIZATIONAL PERFORMANCE OF ISO14001CERTIFIED MANUFACTURING COMPANIES OF INDIA

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ABSTRACT

The aim of the study is to find out the commonly followed green practices in manufacturing companies in India with special reference to south Gujarat region in Gujarat because Gujarat is one of the industrially developed state of India and a manufacturing hub .The sample selected were ISO certified companies because they practice GSCM practices on proactive basis at least to some extent. The methodology used to find out the practices are literature review, in-depth interviews with company experts and practioners of related field and questionnaire surveys with manufacturing industry people. The relationship between Green supply chain management practices and two organizational performance measures companies competitiveness and companies image is studied. The results indicate that most strongly and preferably followed green practices in manufacturing industries are Green manufacturing, followed by Internal environment management, Green design, customer cooperation, investment recovery and less practiced are green packaging, green purchasing, and internal green policy. Green practice implementation practices has the most effect on improving company image, followed by competitiveness.

Keywords: GSCM Practices; Performance Measures; Manufacturing Companies

INTRODUCTION

Supply chain management involves all activities right from the extraction of material to final consumption or the disposal after use. In between activities involved in SCM are manufacturing, use, reuse, recycling, and disposal. Every stage of product life cycle increases the negative burden on the Environment. Addition of the green component to all these activities of supply chain or life cycle processes of the product will certainly reduce the negative environmental impact to some extent. It also leads to cost savings(economic benefits) by waste elimination, waste reduction, effective resource and energy use, reducing emissions, substituting or eliminating hazardous chemical or substance from the product or manufacturing process, proper disposal of solid waste saving regulatory fees and fines for non compliance. There are two approaches related to GSCM. One is involving suppliers and customers as supply chain partners to have better performance results and second is to

measure various performances with more effective performance measures and benchmark them to make effective decisions in GSCM practice selection to achieve desired level of performance.

India is having tenth position globally in manufacturing. It feels the pressure from the global partners to improve their environment and economic performance. Thus India has started showing concerns for its environment performance improvement and has started investing in retrieving and recycling the waste or reusing the products and parts after collection of waste. Green supply chain management practices thus involves the activities like green procurement (green purchasing), green manufacturing, green design for products, green, Green packaging, and investment recovery.

The study aims to investigate the Green supply chain practices, their implementation level and various performance measures measuring performance of manufacturing companies in South Gujarat region India. Green supply chain management includes Green purchasing, green design, green manufacturing, Investment recovery, and internal environment management. Performance measures include competitive measures, and company image. The focus is only on these two measures for performance because these are the least focused areas for performance measurement but certainly plays an important role in motivating companies for long term benefits by implementing green practices.

LITERATURE REVIEW

Manufacturing companies in India implement green practices due to various stakeholders like Suppliers, customers, employees, investors, Government etc. Main objective of implementation of green practices is to improve company image, enjoy competitive advantage, improve operational efficiency, increased economic benefits and enhanced value for customers.
Many researchers in the past have tried to find out the Various GSCM Dimensions.
Lamming and Hampson in (1996) [1]explored environmentally sound practices and linked them with practices like vendor management, collaborative supplier strategies, framing environment procurement policy and including suppliers in companies decisions for better performance results. Walton et al (1998) [2] identified several dimensions of change to increase the impact of procurement on environment results for performance. Hanfeild et al (2002)[3] developed a multi-utility theory approach to measure environmental practices of suppliers. Zhu et al (2008) [4] defined GSCM dimensions as green procurement, internal environment management, eco design, customer cooperation, and investment recovery.
Environmental issues were causing concerns long back but its application in supply chain has started recently. In earth summit-1992 environment protection was the key concept for organizations and governments to protect the environment and make it an integral part of organizational long term strategies for economic development Bhateja et al,.(2011) [5].without proper environmental protection economic development will be undermined.
Many researchers (Zhu et al., 2005, 2007; Ninlawan et al., 2010;) [6] Studied Green supply chain management: pressures, practices and performance within the Chinese automobile industry and Thailand electronics industry. They observed that increasing pressures from a variety of directions improve both their economic and environmental performance. Zhu et al., (2005, 2007) [7] also focused on different dimensions of practices including green procurement, internal environmental management, eco design, customer cooperation, and investment recovery. Hsu, and Hu (2008) [8] studied the green supply chain management in the electronic industry in which they mentioned various approaches for implementing green supply chain management practices, nevertheless no investigation on reliability and validity of such approaches. Shang et al. (2010) [9] and Walton et al. (1998) [10] conducted a GSCM study based eco design, green manufacturing and packaging, environmental participation, green marketing, stock and suppliers. In another study Ninlawan & Tossapol in (2010)[11] works on the Implementation of Green Supply Chain Management Practices in Electronics Industry in which they aims to survey current green activities in computer parts' manufacturers in Thailand to evaluate green supply chain management and they surveyed current green activities in computer parts' manufacturers in Thailand, 11 manufacturers are case studies who provide in depth interview about green procurement, green manufacturing, green distribution, and/or reverse logistics.

To evaluate green supply chain management, the questionnaire related to investigate GSCM practices, measure GSCM performance, and explore GSCM pressure/ driver within Thai electronics industry is used to obtain survey results. Then suggestions to develop GSCM in electronics industry are presented in the end. Mr. Adarsha K and Mr. Prathap B N.(2013) [12] identified 10 dimensions for GSCM practices and implementation in manufacturing (electronic)
Industries to find out which green practices in these dimensions are practiced most.

OBJECTIVE OF THE RESEARCH

To investigate the Green supply chain management practices implementation in Indian manufacturing companies.

RESEARCH METHODOLOGY

The Best Practices Benchmarking Questionnaire have been developed based on Literature review, and expert opinions from manufacturing companies GSCM practioners through pilot study. The questionnaire consists of dimensions. Target respondents of the survey are Environmental managers, production/process in-charge or any senior level manager looking after environmental aspects in the company. Target respondents were requested to answer the questions based on five point Likert scale from 1=strongly disagree, 2=disagree, 3=nor agree nor disagree, 4=agree and 5=strongly agree. The answers were based on their perceptions about the green practice implementation in their respective companies. Factor analysis was applied to group the data into various dimensions based on item co-relations and these groups were named on the basis of various dimensions of GSCM in the literature. The questionnaire items represent different facets of GSCM practice implementation. This study will help the company to know their strengths and weaknesses about GSCM implementation and focus their attention on core areas to improve their performance.

ANALYSIS OF DIMENSIONS, RESULT AND DISCUSSION

Tables given below gives the comparative analysis of effectiveness of GSCM dimensions of Indian companies.10 Dimensions with 40 underlying items considered under this study has its own importance for the effective implementation of green supply chain performance. As per the literature review & experts view, likert is used in this questionnaire, where '1' represents strongly disagree and 5 represents strongly agree. Each scale signifies the effectiveness of each factor for an industry green supply chain performance. For these competitive 'mean score' have been calculated.

Table 1. Performance of Green Procurement (purchasing) [Dimension 1] (Average Mean score is (3.98)

	Factors	Mean scores
1.	Environmental Audit for suppliers for Internal Management (GPu-1)	4.18
2.	Second Tier Supplier Environmental Friendly Practice Evaluation (GPu-2)	3.70
3.	Procurement from ISO 14001 Certified Suppliers (GPu-3)	4.08

Green Procurement", which has 3 underlying factors. In industry the most important practice in this dimension is Environmental Audit for suppliers for Internal Management (4.18) followed by Procurements mainly from ISO 14001 certified suppliers (4.08), and least important practice is Second Tier Supplier Environmental Friendly Practice Evaluation (3.70) .

Table 2. Performance of Green Packaging [Dimension 2] (Average Mean score is (3.97)

	Factors	**Mean scores**
1.	Minimized use of Packaging material (GPa-1)	3.95
2.	Re-collects and plans for Packaging material (GPa-2)	3.93
3.	Customers are environment Conscious and Help in returns handling (GPa-3)	4.05
4.	Centralized Inspection and collection facilities (GPa-4)	3.97

Green Packaging which has 4 underlying factors. In industry the most important practice in this dimension is Customers are environment Conscious and Help in returns handling (4.05) followed by Centralized Inspection and collection facilities (3.97) , Minimized use of Packaging material (3.95), and least important practice is Re-collects and plans for Packaging material (3.93)

Table 3. Performance of Green Design [Dimension3] (Average Mean score (4.20)

	Factors	Mean scores
1.	Design of the product is with easy and quick dis-assembly	4.30
2.	Design of the Parts of the product is for extended use, easy repair & increased efficiency	4.35
3.	Design of product is for re-use ,re-cycle ,recovery of material and component parts	4.22
4.	Identifies, Collects and distributes products and parts that will be re-cyclable and re-usable	3.93

Green design which has 4 underlying factors. In industry the most important practice in this dimension is Design of the Parts of the product is for extended use, easy repair & increased efficiency (4.35) followed by Design of the product is with easy and quick disassembly (4.30) , Design of product is for re-use ,re-cycle ,recovery of material and component parts (4.22), and least important practice is Identifies, Collects and distributes products and parts that will be recyclable and re-usable (3.93)

Table 4. Performance of Green manufacturing [Dimension4] (Average Mean score is (4.35)

	Factors	Mean scores
1.	Design of Products is for Reduced Consumption of material/energy or Bio-degradable material l(GM-1)	4.27
2.	Design of product is to support regulation (GM-2)	4.55
3.	Design of Products is to avoid or reduce use of hazardous material in products & their manufacturing process (GM-3)	4.25

Green manufacturing which has 3 underlying factors. In industry the most important practice in this dimension is Design of product is to support regulation (4.55) followed by Design of Products is for Reduced Consumption of material/energy or Bio-degradable material (4.27) , and least important practice is Design of Products is to avoid or reduce use of hazardous material in products & their manufacturing process (4.25)

Table 5. Performance of Investment recovery [Dimension5] (Average Mean score is(4.06)

	Factors	Mean scores
1.	Sells scrape and used materials (IR-1)	4.38
2.	Sells Access capital equipment (IR-2)	3.95
3.	Applies reverse Logistics in Stock Planning (IR-3)	3.85

Investment recovery which has 3 underlying factors. In this dimension the most important Practice followed by industry is Sells scrape and used materials (4.38) followed by Sells Access capital equipment (3.95), and least important practice is Applies reverse Logistics in Stock Planning (3.85)

Table 6. Performance of Customer co-operation [Dimension 6] (Average Mean score is (4.16)

	Factors	Mean score
1.	Cooperation with customer for cleaner production (CC-1)	4.15
2.	Cooperation with Customers for Green Packaging (CC-2)	4.13
3.	Cooperation with customers for eco design (CC-3)	3.98
4.	Cooperation with Customers for Environmental procurement	4.20

	(CC-4)	
5.	Cooperation with Customers for using less energy during Transportation (CC-5)	4.23
6.	Recovers or sells access Inventories / material (CC-6)	4.13
7.	Integrated production with recovery (CC-7)	4.10
8.	Design of the product is to reduce waste and cost (CC-8)	4.50
9.	Carryout life cycle analysis of the product (CC-9)	4.05

Customer cooperation which has 9 underlying factors. In industry the most important practice in this dimension is Design of the product is to reduce waste and cost (4.50) followed by Cooperation with Customers for using less energy during Transportation (4.23), Cooperation with Customers for Environmental procurement (4.20), Cooperation with customer for cleaner production (4.15), Recovers or sells access Inventories / material (4.13), Cooperation with Customers for Green Packaging (4.13), Integrated production with recovery(4.10), Carryout life cycle analysis of the product (4.05) and least important practice is Cooperation with customers for eco design (3.98)

Table 7. Performance of Internal Environment management [Dimension7] (Average Mean score is (4.32)

	Factors	**Mean scores**
1	Cooperation with suppliers for environmental objectives	4.33
2	Design Specification to suppliers that include environmental requirements for purchased item	4.28
3	Engages itself in an environmental friendly disposal	4.35

Internal environment management which has 3 underlying factors. In industry the most important practice in this dimension is Engages itself in an environmental friendly disposal (4.35) followed by Cooperation with suppliers for environmental objectives (4.33) , and least important practice is Design Specification to suppliers that include environmental requirements for purchased item (4.28)

Table 8. Performance of Internal green policy [Dimension8] (Average Mean score is (3.97)

	Factors	**Mean scores**
1	Holds awareness Programmes for suppliers	4.00
2	Use of non Conventional sources of energy	3.68
3	Applies Environmental issues	4.25

Internal Green Policy which has 3 underlying factors. In industry the most important practice in this dimension is Applies Environmental issues (4.25) followed by Holds awareness programme for suppliers (4.00), and least important practice is Use of non Conventional sources of energy (3.68)

Table 10. Performance of Company Image [Dimension10] (Average Mean score is (4.40)

	Factors	**Mean scores**
1	Started Reaping Long Term benefits	4.27
2	Enhance Corporate Image	4.43
3	Innovation in Product and Process Design.	4.52

Company image which has 3 underlying factors. In industry the most important performance indicator of GSCM implementation in this dimension is Innovation in Product and Process Design (4.52) followed by Enhance Corporate Image (4.43) , and least important indicator is Started Reaping Long Term benefits (4.27).

CONCLUSION

This Research study presents practitioners with a 40 item measurement scale for evaluating the different facets of their green supply chain practices implementation. Green Supply Chain

Management (GSCM) is a relatively new emerging issue for the majority of Indian industries. The present empirical study investigated the GSCM practices adopted by the manufacturing industry in India. This study also studied the relationship between GSCM practice implementation and various performance indicators. It will also help the practioners to know which practices in which dimension are preferably followed by industry. Present study included a questionnaire. This study also focused on the impact of environmental collaboration in the supply chain on manufacturing and other functional areas of the companies. This study also shows that all the green practices are not followed by companies in the equal amount may be because all companies differ in the availability of their resources, capabilities and approach towards GSCM implementation. The future studies can be industry specific to know the more relevant green practices for their industries as all practices may not be applicable to all.

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