Green Supply Chain Management Practices in Automobile Industry: An Empirical Study

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ABSTRACT

Green Supply Chain Management (GSCM) has emerged as new management strategy for automobile organizations to become more environmental friendly, cost effective and competitive. The aim of this study is to review the literature of GSCM Practices and find out the common GSCM practices amongst the automobile and auhto-component organization in Madhya Pradesh (India). The data came from survey of 10 organizations. From the literature, we have found 26 GSCM Practices. According to the survey results, some practices are at the best stage but most are on the primary stage. So, we have found that there are opportunities for business to adopt more environmental friendly operations.

Keywords: Green Supply Chain Management, Automobile, Practices .

1. INTRODUCTION

The traditional supply chain comprises five parts: Raw material, Industry, Distribution, Consumer and Waste. Each of the links in the supply chain can be a reason for pollution, waste and other hazards to the environment. Regarding raw materials, a supplier may use environmentally harmful materials such as lead. However, organizations can put pressures on suppliers to use more environmentally friendly materials and processes (Shekaria et al 2006). Supply chain management has become a promising area in achieving sustainability due to international environmental pressures and concept of "Green Supply Chain Management (GSCM)" (Hunag et al 2012). GSCM has appeared as an important component of business activities to help organizations develop 'win-win' strategies that achieve profit and market share objectives by lowering their environmental risks and impacts, while raising their ecological efficiency (Zue et al 2004). The cross-disciplinary field of Green Supply Chain Management has been growing in recent years with an interest from both academia and industry. A preponderance of special issues devoted to this topic in leading operations and supply chain management (SCM) journals attests to this trend (Zhu et al 2011).

An automobile (OEM) and auto ancillary manufacturer has to adopt GSCM practices and Environment management system (EMS ISO 14001) with increased pressures from regulation, customer choice / awareness and international competitive market, as the major focused area in the operations. Now days, every organization is working towards environmental management to improve their overall performance. Toyota is one of the leading organizations in the green initiatives in automobile industry. Toyota has adopted its green principles in 1992 to provide clean and safe products and enhancing the quality life of every one through their activities. Since year 1992, toyota is working for the green, green procurement, environmental action plans, Hybrid vehicles, Environmental campaign and other best activities.

According to the Environmental Leaders (ELs), ford is tripling its electrified vehicle production capacity and increased production of its efficient Eco-Boost engines. Ford has also reduced the amount of energy used to produce one vehicle in its manufacturing facilities by 10% from 2010 to 2011 and by 22% in the last 6 years (Ford CSR, 2011). In 2011, Ford and Toyota had signed a MOU to develop advanced hybrid system for light trucks and SUVs to bring greater fuel efficiency that consumers demand in their new vehicles (ELs, 2011).

Our purpose behind this study is to find out the GSCM Practices from the literature and common GSCM practices amongst the automobile and auto- component organization in (Indore, Pithampur and Dewas, Madhya Pradesh) India. This paper begins with a brief description of India's automobile industry and GSCM initiatives. It goes further ahead to overview to the literature of GSCM practices, in the section 3. Then in section 4 we provide detail of an empirical study on GSCM practices of the automobile and component on the survey of 12 organizations in the India (Pithampur, dewas district, Madhya Pradesh). The paper ends with the results, conclusion and suggestions, respectively.

2. INDIAN AUTOMOBILE INDUSTRY AND GREEN SUPPLY CHAIN MANAGEMENT

2.1 An Overview of Indian Automobile Industry

According to the report of RNCOS (2006), the automotive industry in India is now working in terms of the dynamic of an open market. Many joint ventures have been set up in India with foreign collaboration, both technical and financial with leading global manufacturers. In addition, a very large number of joint ventures have been set up in the auto-components sectors and the place is expected to pickup even further. The Indian automobile (OEM) industry can be segmented into the two wheelers, three wheelers, commercial vehicles, passenger cars and utility vehicles. The auto ancillary industry can be grouped under Engine parts, Transmission, Electrical parts, equipments and others. Madhya Pradesh (M.P.) is location at the centre of India has led to its emergence as an important destination for automobile and auto component industry. The industrial belt around Indore (Pithampur and Dewas) has production facilities for number of automobile manufacturers. Investment climate in M.P. has an abundance of natural resources (water, minerals, power, and labour). Prominent automobile players present in M.P. are mahindra 2-wheelers Eicher Motors, MAN trucks. (Source: ibef.org) . The Indian auto industry is one of the most promising and developing across the globe, because of cheap labour, easy availability of resources, high production capacity and feasible government policies. This juncture of automobile is facing environmental challenges to make existence in the international market. According to Centre of science and Environment (CSE) project in Indian automobile industry majority of pollution during the production takes place at the supplier and vendor's site, automobile companies had a very poor environmental performance and companies need to green up their supply chain.

2.2 Green Supply Chain Management

GSCM is the process of using environmentally friendly Material, Processes and Output in which, there is definite end life of the product with reusable or disposable form. It took place because of climate change, scarcity of natural resources, global warming, initiatives by some NGOs for the benefit of environment as well as society. With the help of GSCM, an organization can assess the environmental effect of the product and process. The different authors have defined GSCM. Srivastara, (2007) has defined GSCM as integrating environment thinking into supply chain management, including product design, materials sourcing and selection, manufacturing processes, delivery of the final product to the consumers, and end –of-life management of the product after its useful life. According to Lu at al. (2007) GSCM refers to improving the environmental performance of companies, their supplier and customers, and the links between them. GSCM works with the Rs; these are Reuse, Reduce, Rework, Refurbish, Reclaim, Recycle, Remanufacture so on.

3. LITERATURE REVIEW

The definition of the purpose of Green supply chains, which range from reactive monitoring of general environmental management programs to more proactive practices such as the Re's (e.g. recycling, reclamation, remanufacturing, reverse logistics) of environmental management and incorporating "innovations", also seem to differ. This lack of consensus in practice and definition of GSCM is not surprising , since I lies at the confluence of elements of corporate environmental management and supply chain management which are both relatively new areas of study and practices, if not new terminologies to explain older practices (Zue et al , 2004). Developing practices, processes and products that have minimal impact on the ecosystem has become a key driver for supply chain management professionals. "Going green" can both lower cost and provide a competitive advantage, yet majority of firms remain underprepared (Grandzol

et.al). kumar et al investigates the correlation of 2 major factors Organizational learning and management support, with the extent of adaptation of GSCM practices in Indian manufacturing. They found a positive correlation in Organizational learning and management support. In this paper we have consider different GSCM practices based on literature. The common practices, which we found are appear in table 1. According to the Zhu et al (2004), GSCM has four practices, which represent some of the main internal and external activities, and functions with the organizational SMC are internal environment management, external GSCM including green purchasing and cooperation with customer including environmental requirements, investment recovery and eco design practices. The internal practices or internal environment management is the key to improve enterprises performance and the support from the top level and mid level manager is a key to successful implementation of GSCM practices (carter et al, 1998 Bowen et al, 2001). External GSCM practices are outside of the organization in the 1998 Zsidisin et al identifies environmental purchasing, cooperation with the supplier for environmental objectives, ISO 14001 certification as the key external practices by the organization.

Table 1: Classification of GSCM Practices (Source Trigos, 2007)

Sr. No.	*Theyel (2001)*	*Bowen et al. (2001b)*	*Zhu and Sarkis (2004)*	*Srivastava (2007)& Bowen et al. (2001a)*
1.	Setting environmental requirements	Greening the supply process	Internal environmental management	Product-based
2.	Sharing information	Product green supply	External GSCM practices	Process-based
3.	Collaboration	Advanced supply chain	Investment recovery	
4.			Eco-design	

4. METHODOLOGY AND SURVEY ANALYSIS

4.1 Objective

This paper attempts to find out

- GSCM practices from the literature of the empirical studies and
- Common GSCM practices in automobile industry through questionnaire.

4.2 Research Framework

This study conducted a survey to obtain GSCM common practices. The survey was conducted using questionnaire and direct interaction. The population of the study consists of automobile and auto ancillary organizations in Madhya Pradesh. The organizations are manufacturing/ Original Equipment Manufacturers (OEM). This study combines issues related to supply chain management with Green aspect. Therefore, the appropriate people to get the required data are the Managers and General Managers of Supply chain/ Purchasing/ Production departments. The total population of the study is 10 organizations. We have developed questionnaire of 26 GSCM practices based on the literature with the two options yes / no. All the responded/ organizations were personally visited and questionnaire were filled by responded.

4.3 Profile of Sample Organizations

The characteristics of responding organizations are presented in Table 2. The table shows that there was 5 automobile (OEM) and 5 component organizations. 40% of the organizations belong to the less than 500 employees and 20% are in combined belong from the more than 501 and more than 1501.

4.4 Sampling Design

For this survey, we have used convenient sampling and directly interacted with the organizations' Managers/ employees (one from every organization). Total ten automobile and component organizations from the Pithampur and Dewas (M.P., India) participated in the study by filling up questionnaire.

Table 2: Distribution of survey responded by the size

Industry	*Total*	*Percentage*
Automobile (OEM)	5	50
Auto components	5	50
Total	10	100
Size		
> 1501	2	20
1001-1500	2	20
501-1000	2	20
0-500	4	40
Total	10	100

5. DISCUSSION OF RESULTS

The responses from the participants are summarized from the table 3 thtough table 8. Each table contains group of practices based on Nature of practices. Table 3 displays the internal practices of GSCM of the responded automobile organizations. There is good control and participation of organizations to reduce the toxic emission at the plant level (93.75%). 93.75% responded replied positively to practicing in monitoring of resource consumption and cross-functional cooperation is in the GSCM with the same range. Training to the employee on Green is on the prior stage with 56.25%; instead of this, 81.25% responded yes for the skilled HR. The top management is committed towards green practices, management supports to provide fund and formulate polices for the green operations.

In the next Table 4, we analyzed the GSCM practices in the context of Green activities in all departments like IT, transport, logistics, purchasing, manufacturing with green. In the green activities, level of IT (SAP, ERP etc) is at a very good intensity, 81.25% respond they have well IT in their organizations. While transport greening (56.25%), green purchasing (50%) and green logistics (43.75%) are on the initial stage or not that much active. 81.25% response in the positive that they are practicing green manufacturing (less wastage, effective use of resources).

Table 3: Interanl Practice on GSCM

GSCM practices (n=10)	*Yes*	*No*
Reduction of toxic emissions at plant level	93.75%	6.25%
Monitoring of resource consumption and pollution	93.75%	6.25%
Employee Training Programs on Green	56.25%	43.75%
Quality of human resource / Man Power Involvement	81.25%	18.75%
Cross functional cooperation	93.75%	6.25%
Self regulation or management / commitment	81.25%	18.75%

Table 4: Green Activities at the all Departments

GSCM practices (n=10)	**Yes**	**No**
Level of Information Technology	81.25%	18.75%
Transport Greening	56.25%	43.75%
Green purchasing	50%	50%
Green logistics	43.75%	56.25%
Green manufacturing	81.25%	18.75%

Table 5 has summarized that GSCM practices are externally related. Responded automobile and component industries are not practicing Eco-labeling of their product (43.75%) or practicing at the very initials level. We can say that it is not common practice than cooperation with the customer for eco design (87.50%). Eco design is from the production to the use and disposal of the product is less harmful for the environment (BS3 and BS4 engines, hybrid cars).

Table 6 displays the life assessment of assets, which organizations used while manufacturing. In investment recovery (sold out old assets) 81.25% are active they

Table 5: Eco Design of Product

GSCM practices (n=10)	*Yes*	*No*
Eco Labeling of Product	43.75%	56.25%
Eco design	75%	25%
Cooperation with customer for Eco- design	87.50%	12.50%

convert those into the cash. On the other hand, reverse logistics (12.50%) (Calling back the wastage/ scrap of sold product) is very poor in the automobile organizations because of poor regulations, high life span of products and so on. Only 43.75% respondent practice the Product life cycle of their product, which is very poor.

Table 7 displays the performance evaluation of GSCM practices. The results shows that all the automobile and auto component industries are very poor in developing performance evaluations criteria with green performance (37.50%), green effectiveness (37.50%) and performance

Table 6: Assets and Product Life Assessment

GSCM practices (n=10)	Yes	No
Investment Recovery	81.25%	18.75%
Reverse logistics	12.50%	87.50%
Product Life Cycle Management	43.75%	56.25%

standard at the same level only 37.50% said yes to have GSCM performance standard. On the other part, the respondent are very rational while resource allocation with 87.50%. Therefore, we can say that the organizations should work on the establishment on GSCM performance standards.

Table 8 displays the priority of GSMC agenda in budgeting and Environment Management System. We found that only 56.25% were ISO 14001 certified and 56.25% face the environmental audit. It means that ISO certification is not common practice amongst the respondent. Green is not very important drive (element) 37.50%, while framing

Table. 7: GSCM Performance Standard and Resource Allocations

GSCM practices (n=10)	Yes	No
Evaluation of Green Performance	37.50%	62.50%
Evaluation of Green Effectiveness	37.50%	62.50%
Clear Green Supply Chain Management performance standards	37.50%	62.50%
Resource Allocation	87.50%	12.50%

budget of the supply chain and less priority has given to the GSCM in budgeting with 43.75%. Instead of all this, they used to practice environmental R &D with the high score of 81.25%. It is due to government norms for the disposal of wastage, recycles of water, and high cost of energy.

Table 8: GSCM Budgeting and EMS

GSCM practices (n=10)	Yes	No
Green as a driver in the SC agenda	37.50%	62.50%
Environmental Audit performed	56.25%	43.75%
Priority of Green supply chain management In Budgeting Consideration	43.75%	56.25%
Environmental R & D	81.25%	18.75%
Environmental management system ISO 14001	56.25%	43.75%

6. CONCLUSION

We found that the ten automobile and auto component organizations were engaging in several GSCM practices. The common practices in their operations are resource allocation, Investment Recovery Cooperation with customer for Eco-design reduction of toxic emissions at plant level, Level of Information Technology, Green-manufacturing Monitoring of resource consumption and pollution Employee Training Programs on Green, Self regulation or management / commitment Cross functional cooperation, Quality of human resource / Man Power Involvement. The organizations should go for the improvement of less common practices so as to compete with international market. They should start to prioritize to consider ISO 14001 certification, Green purchasing and reverse logistics. Previous researches have shown that, results from the implementation of GSCM practices are positive. Therefore, the management should train their employees to work with less wastage and for the safety of environment. Government should also frame certain polices to make organizational operations more environmental friendly like tax rebate, allowances and training on the environment safety. For the effective implementation of GSCM practices, every stakeholder has to contribute, than only we can protect our environment.

7. LIMITATIONS AND FUTURE RESEARCH

A limitation of our study was the number of organizations (sample). In-depth analysis is possible with the large number of organizations or case study of organization can be done in Indian automobile GSCM practices and performance. Future researches should study the larger sample of the organizations and with the different manufacturing sectors like steel, pharmaceuticals and others. Another avenue for the research may be practices and performance measurement of Indian automobile industry. These studies may help to the government and organizations to formulate environmental policies for the future growth.

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