

**PROJECT DISSERTATION REPORT ON
GREEN SUPPLY CHAIN MANAGEMENT:
ANALYSIS OF BARRIERS OF GSCM IN
INDIAN AUTOMOBILE INDUSTRY**

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CERTIFICATE

This is to certify that **Surabhi Pant**, a student of MBA from Delhi School of Management, Delhi Technological University has submitted a Research Project on the topic '**Green Supply Chain Management: Analysis of barriers of GSCM in Indian Automobile Industry**'.

During the project, I found her to be very hardworking, sincere and inquisitive to explore new things. She is able to get across his points effectively and convincingly. She has the ability to withstand stressful project conditions and meet the deadlines.

I wish her all the success in her career and life.

Project Guide

HOD

DECLARATION

I, Surabhi Pant, student of MBA 2017-19 of Delhi School of Management, Delhi Technological University, hereby declare that Major Research Project on “**Green Supply Chain Management: Analysis of Barriers of GSCM in Indian Automobile Industry.**” submitted in partial fulfillment of Degree of Masters of Business Administration is the original work conducted by me.

The information and data given in the report is authentic to the best of my knowledge. This report is not being submitted to any other University for award of any Degree, Diploma and Fellowship.

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EXECUTIVE SUMMARY

Going green is getting light throughout the world. With rising level of consumer education, people are now more aware about the impacts on the environment caused because of their activities. People are now interested in buying eco-friendly products as a means to contribute to the environment in some manner. However what they don't know is that the tag of eco-friendly is not enough. The organizations have to realize the need to bring about a change in their supply chain. Incorporating the green aspect at each level of supply chain can be termed as "Green Supply Chain Management". The concept is relatively new and has had been implemented in a few nations across the globe. However talking about Indian industries, we still lack behind. The primary problem here is the education level of consumers and their demand for eco-friendliness. Because of low level consumer intervention, the organizations fail to incorporate the concept of sustainability and blindly follow the path of generating profits at the expense of environment.

Talking about GSCM in automobile sector, we are on ground zero. Even though India is one of the largest automobile manufacturer and market yet there is hardly any policy in the organizations that aim at sustainability. China, which is a rapidly growing economy as ours, has already started implementing GSCM in the automobile sector at a vast scale. However we are lagging behind. So what are the reasons contributing to this? The paper tells about the barriers that might be present that hamper the implementation of GSCM in Indian Automotive sector. The major factor realized is lack of consumer knowledge. It is none other than the consumers who have the potential to make or break an organization. If they are not interested then neither are the top level executives. Thus consumers need to realize the need to go green and companies also need to realize that sustainability might prove to be costly initially but it will reap bigger benefits in the long run. Thus for staying in the market it is important that organizations take up the concept of GSCM.

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1. INTRODUCTION

Supply Chain Management can be defined as the effective and efficient movement of goods and services along the pathway created for the purpose. SCM is a far reaching and complex endeavor that depends on each accomplice- from providers to makers and past-to run well. Because of the SCM, businesses benefit a lot since they are able to cater to the needs of customers effectively and generate healthy profits. However it so happens that in the process, the hazards caused to the environment is completely neglected. The rapid growth of economy might sound appealing in the short run, but the consequences to the environment are disastrous. The problems of pollution, constantly depleting resources, global warming etc. are some of the concerns. To cope up with this scenario and maintain the sustainability, government has introduced several laws that restrict industries from rapidly declining the environment. And it is for their own good and the welfare of the upcoming generations if they abide by the laws. The organizations have to deal with the constant problem of environment degradation and resource depletion. Thus for sustenance in the world of competition, the organizations need to tackle the problems and their own processes to stay working, and simultaneously strike a balance with the environment. The nations are constantly monitoring any innovation related to the 'Green' products. Last 'Earth Summit' of 2012 held at Rio de Janeiro focused on sustainable development in the economy.

For the above stated problems, the businesses are constantly working to implement the concept of 'Green' in every domain. And since supply chain links all the processes together, it is of utmost importance to introduce the concept of 'Green' in supply chain as well. The various activities involved in a typical supply chain leads to the emission of effluents into the environment and cause serious environmental problems. The problems are a lot more serious in developing economies like India because of the rapid expansion of industries. Thus these economies have a wide scope of improvement. Green Supply Chain Management is a relatively new concept and organizations as well as the environment benefit from it extensively.

1.1 Objectives of the Study

The objectives of this study are as follows:

1. Extensive review of literature that talks about the concept of Green Supply Chain Management in Indian Context
2. Listing out the various aspects related to GSCM- advantages, challenges and opportunities.
3. Using literature finding out the barriers that impact the implementation of GSCM in Indian Automobile Sector.
4. Carrying out empirical study of the barriers.
5. Conducting study using Interpretative Structural Modeling and finding out the relationship and the level of the barriers being considered for the study.

1.2 Green Supply Chain Management

Green Supply Chain Management can be defined as the incorporation of environment friendly habits into each stage of supply chain and also inculcating them into the individuals who work along the chain. In very simple terms the introduction of the 'Green' or the concept of sustainability and environment friendliness in a typical supply chain can be referred to as Green Supply Chain Management (GSCM). As per defined by Srivastava, GSCM can be described as, "integrating environmental thinking into supply chain management, including product design, 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". According to Penfield, "Green Supply Chain Management is the process of using environmentally friendly inputs and transforming these inputs into outputs that can be reclaimed and re-used at the end of the cycle, thus creating a sustainable supply chain". Kishore Bhattacharjee of Amity Global business school given a very apt equation of green supply chain management, "GSCM= Green Purchasing+ Green Manufacturing/ Material Management+ Green Distribution/ Marketing+ Reverse Logistics+ Recycling". It has been noticed that successful green supply chains stress upon recycling, reduction in the amount of effluents and in general amount of waste generated as a result of the process and in the meanwhile leads to increase in the overall efficiency of the organization. The practices of improvising sustainability in the supply chain should be an integral part of the business and should be incorporated into the vision of the organization.

Throughout the globe, businesses continue to use toxic chemicals, plastic packaging material and emit hazardous gases into the atmosphere; this in turn contributes to global warming. However, at each stage in the typical supply chain, there exists opportunities that can be harnessed to reduce hazardous impact on the environment.

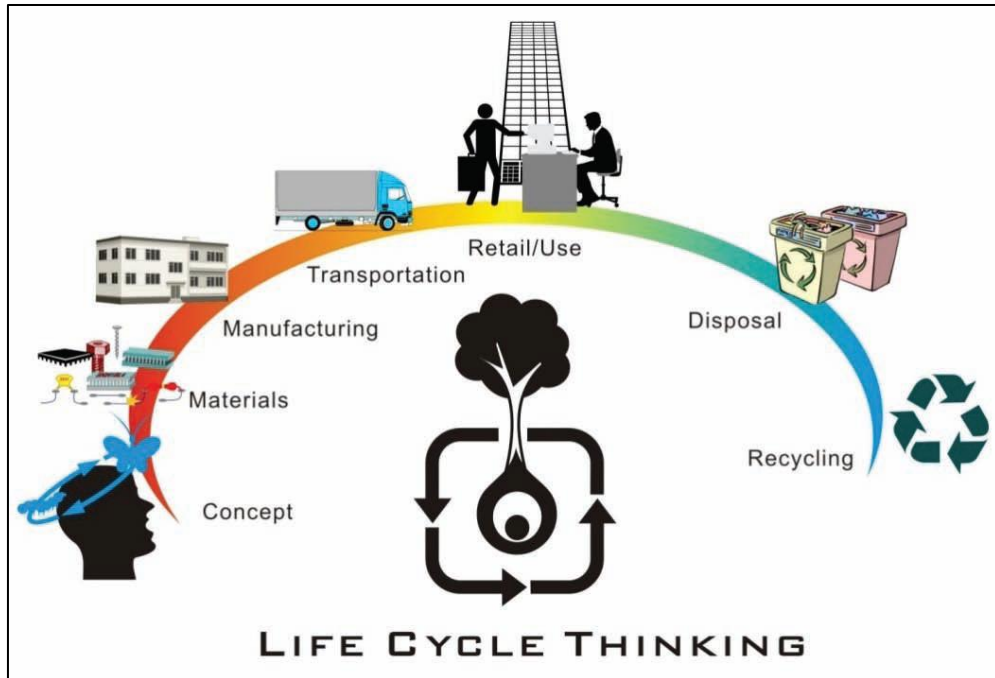


Figure 1.2.1 (Source Google)

As it is very clear from the figure above, as every point of the supply chain, there is a scope for reduction of pollution (of any kind). The Rs of Conservation, Reduce, Recycle and Reuse are very helpful in reducing pollution by a large scale. Thus, it is of utmost importance for the organizations to have complete knowledge about the concept of GSCM since it won't only benefit the organization but also benefit the environment and help the organization to sustain in the long run.

Prashant Raman has pointed out 3 CIs that help organizations attain efficiency. These are:

“1. Continuous Innovation: Factor to reduce risk component and trigger rapid innovation.

2. Continuous Improvements: Analyzing the GSCM activities generally leads to innovative processes and regular improvements.

3. Continuous Interactions: It involves negotiating policies with all the stakeholders like suppliers and customers, resulting into better alignment of business processes and principles.”

Keeping in view of the bigger picture, the suppliers can also be motivated to provide ecofriendly raw material which in turn generate lesser waste and produce better products.

1.2.1 Why is going Green the need of the hour?

Organizations these days are increasingly showing concern about social responsibility and are trying to impart their thinking to the supply chain processes. Different organizations find different reasons to inculcate the concept of 'going green' in their processes.

Following are some of the factors which motivate the organizations:

1. **Reduced Cost:** There might be higher investment at the start of the business but with time, the incorporation of such technologies in the business will help to save costs, be it in terms of electricity, wastage etc.
2. **Reduced employee attrition:** Employees today seek motivation to work in an organization and that motivation is not just related to monetary benefits, but social motives as well. Working for an environmentally conscious company motivates the employees to work and take pride in their work.
3. **Tax Reduction:** Using green methodologies help organizations claim reductions in tax since the government motivates such activities and thus in turn organizations gain.
4. **Building Brand:** The era of competitiveness has leaded all the organizations to indulge in some of the other activity. Even small initiatives taken by organizations, if advertised in an appropriate manner can lead the consumers to believe that they are giving in their money that helps the environment. Thus this helps them build customer loyalty.

These factors along with the concept of sustainability lead the organizations to go green. Thus the adoption of green policies helps organizations to create positive social impact.

In what ways do SCM and GSCM differ?

| Sr. No. | Characteristics | Conventional SCM | Green SCM |
|---------|-----------------------------|--|--|
| 1 | Objective and value | Economic | Economic and Ecological |
| 2 | Ecological optimization | Integrated approach is high | Ecological Impact, |
| 3 | Supplier selection criteria | price switching suppliers short term relations | Ecological aspect, long term relations |
| 4 | Cost | Low | High |
| 5 | Speed and flexibility | High | Low |

Figure 1.2.2 (Source: Traditional & Green Supply Chain Management by Sanket D. Kadam, Akshay A. Karvekar , Vishal J. Kumbhar)

The objectives achieved through typical SCM are as follows:

- Accurate management or optimization of inventory levels.
- Reduction of cost incurred during the processes.
- Reduction of lead time.
- Increased capability to handle rise or fall in various factors such as inventory, demand, raw material etc.

These are the objectives attained through GSCM:

- Incorporation of environment friendly habits into the business.
- Attaining increased level of competitive advantage and in turn have an edge above the other competitors.
- Making changes in existing methods.
- Spreading awareness about the importance of sustainability and showing how drastically business processes have impacted the environment in the recent past. And spreading the word that if there is no environment then there will be no business as well.

Thus, in a supply chain, the progression of materials and data is straightforward and end to end. There is a limited effort coordinated and perceptible. Each accomplice in the production network has limited data, for example on carbon printing and the emission of greenhouse gases from different accomplices. Thereafter, each player may be concerned about his own impression and try to diminish it, regardless of its effect on the network of uphill and downhill stores. It may be worth starting to finish the costs of the inventory network but, because of the limited data sharing, the costs are far from being simplified in general.

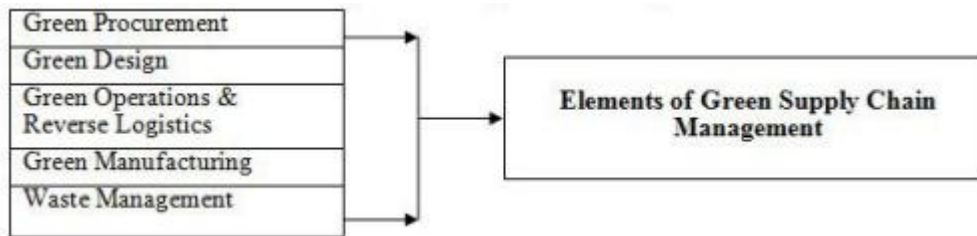
Meanwhile, green supply chains are thinking about the ecological impacts of all inventory network procedures, from raw material extraction to the last transfer of goods. In the green supply chain, each competitor persuades the various competitors to move towards environmental protection and provides essential data, support and direction, for example through supplier improvement projects or customer support. The destinations of the conditions and the estimate of the execution are coordinated with the operational and financial objectives. With this combination, the green supply links at that time will aim to achieve what no single association could achieve on its own, in any case achieve: limited waste, limited environmental impact while ensuring compliance and benefits improved for buyers.

As per an article published in The New York Times, the increasing concern has been seeing among investors who want to invest their money in funds related to sources of renewable energy. New portfolios are being developed keeping in mind the recent demand of investors. The focus here is to address the technology created to tackle the environmental changes. Yet, the implementation of sustainability in the supply chain is still in its nascent stages all through the various industries. And when it comes to countries with huge population as that of India, it is correctly observed that people themselves are not very much aware about the scenario owing to the general lack of education among the masses.

1.2.2 Components of Green Supply Chain

Cyrus Saul Amemba *et al* (2003) have successfully highlighted the most important components of a green supply chain in their research.

The components are as follows:



1. **Green Procurement:** In simple terms this can be put up as purchasing environmental friendly products or raw materials and simultaneously stepping into the concept of 3 Rs of conservation. Any organization which is genuinely interested in going green can make green procurement to reach out to the results. For green procurement, it is required that the suppliers are informed beforehand about the characteristics of the products that the organization might be seeking. Prevention is better than cure and hence green procurement is easier on the cost for the organization since it produces lesser amount of waste. The concepts of recycling and reusing form essential part of the green procurement. If organizations start indulging in such greener habits, generate lesser waste and pollution, they can in fact act as a motivation or maybe competition to other firms which may end up going green as well. Thus the initial cost incurred for green procurement may be high, but the organization end up saving a lot by minimizing waste disposal.
2. **Green Design:** This implies that products are built in accordance with the norms that lead to environment improvement. The product should be built in a manner that it is eco-friendly. What can be done for this? Either the toxic raw materials are replaced or the process is changed as per the needs.
3. **Green operations and Reverse logistics:** Green operations is linked to all the day to day activities in a supply chain, starting from manufacturing to handling of waste generated in the process. This happens after process of green design is

done. Adding to this, reverse logistics is the reuse of materials that are deemed as waste. The way toward arranging, actualizing, and controlling the productive, financially savvy stream of crude materials, in-process stock, completed merchandise and related data from the purpose of utilization to the point of beginning to recapture esteem or legitimate transfer. All the more definitely, turn around coordination is the way toward moving products from their common last goal to capture esteem, or appropriate transfer. Remanufacturing and repairing exercises likewise might be incorporated into the meaning of reverse logistics.

4. Green manufacturing: This implies changes made to the existing processes in the assembly line to make the line eco-friendly. The processes used for this are designed in a manner to not hurt the environment. A lot of R & D is required for this since the changes should also not hamper the production ability of the firm. Changes like use of alternatives to exhaustible fuel for example solar and water energy, using technology to improving the output rate and minimize the wastage. Another component here is that of remanufacturing. It involves the addition of recycle component into manufacturing. In all, not only green manufacturing benefits the environment but also is economically feasible for the organization in the long run. Another keyword here is 'remanufacturing'. Remanufacturing can be defined as continuing with the manufacturing by reusing the materials that have been previously manufactured. Some parts that are deemed to be useless, can be utilized by making certain changes instead of abruptly throwing them away. In this manner, a lot of resources can be saved. Also, there will be a reduction in the amount of waste generated.
5. Waste Management: Waste generated as a result of manufacturing should be disposed off in an effective manner since the waste produced in the process maybe full of chemicals and might harm the environment in some form. Introducing the concept of green procurement can be highly beneficial for the firm since it will lead to less waste generation and less amount of toxic waste as well. Also, there are several legal implications that restrict industries to throw off waste in any manner. Thus waste management is a very important part of GSCM

since waste will be generated, even if it is in less quantity. What matters is that whether the environment is able to disintegrate it.

1.2.3 Steps to implement GSCM

After all the discussion about the definition of GSCM, it is of much importance to know that how can organizations plan out to implement the green aspect in their supply chains. Since, this is not a one day process; it takes time and careful planning to achieve the desired objectives that the organization seeks from implementation of GSCM.

Following are the steps for the same:

1. Form a detailed layout of the existing supply chain: As the first step, organizations should have complete knowledge about their supply chain, because at times it is seen that the senior level executives are not aware about the nitty-gritty of the processes going on, yet they are the ones that are the sole decision makers. When a detailed layout is prepared, the organization can work out at the specific point where there is a problem or where environment degradation is done. Thus it will become easier to identify the target area. Suppliers play a key role in this and an in-depth study should be done on them to sort out the suppliers which are not in sync with our theory of environmental sustainability.
2. Let the workers know what's going on: Even though the executives take the decision, it is the workers or the employees who are required for successful completion of a task. Telling the workers about the impact that the organization will make on the environment and the competitive edge that they will attain will motivate the workers. Also an increased communication will lead to the inculcation of environmental friendliness into the corporate culture of the organization.
3. Set standards for suppliers: Supplier evaluation is an important need of the hour. Some benchmark needs to be set by the company in order to sort out the different suppliers and careful performance evaluation needs to be done. The expectations should be communicated one on one from both the dealing parties.

4. Employee training: As it has been seen on various instances, employee resistance to change can very easily hamper any new initiative taken by the organization. Change in employee rigid mindset is crucial especially for something they don't perceive as important. Knowledge management is very important in such a scenario. Extensive interactive training programs should be conducted where there is a one-on-one communication and any of the doubts and queries that are brought forward must be resolved. This will help in bringing a change in the organizational culture. An effective way to do this is by telling stories of businesses that have succeeded by going green. Thus any mind block should be removed from the employees.
5. Take steps to improve performance: The first most important step is the setting up of benchmark. Timely conducted drives to evaluate the working and comparing it with the benchmark set it very important. This will help the organization to identify the gaps and measures to rectify the gaps should be taken. Yet employees need some motivation to work. Evaluations and reviews combined with some benefits that remunerate property endeavors have a greater capacity to drive manageability execution. Empowering straightforwardness and picking or concede a great deal of business to providers with more grounded property execution are powerful in driving improvement. Wherever this can be unsatisfactory, motivating forces — greater access to your value chain, similar to access to clients or customers — can likewise be powerful.
6. Join hands with other organizations: It is very much possible that some organizations find it increasingly difficult to develop or implement a green technology. In such a scenario collaboration amongst various companies is a must for the process of benchmarking and identifying the ideal practices being followed by some particular organization. Joining hands help the organization pool their resources and save on time, money and tiredness. As it is known that knowledge sharing leads to better ideas and innovations, some major breakthrough ideas can be developed in this manner. Thus in this manner a proper layout to map green supply chain, identification of factors affecting the

execution, criteria to evaluate the existing working and developing a revolutionary idea regarding sustainability can be developed.

1.2.4 Importance of GSCM

1. The implementation can give organization a competitive edge. Even though the initial investment is high, the benefits earned in the longer run are worth the investment and help in cutting the cost related to operations.
2. By holding on to the green endeavor, organizations can have savings in the longer run.
3. The GSCM endeavor can give rise to a new market that deals in selling eco friendly products. There are instances in SE Asia wherein several companies have come up to cater the needs of the companies implementing GSCM.
4. Implementation of GSCM aligns with the government policies of improving the environmental health. Thus this can help the government sustain their position as a market for sustainable products. Also there is optimum utilization of resources which lessens the burden on government to think of implementing new policies on a regular basis.

1.2.5 Challenges of implementing GSCM

1. The initial cost incurred by the organization for the implementation is too high. For green products, green process etc. a lot of research is required which is very expensive.
2. It is possible that the consumers show little or no interest in the GSCM. It is then up to the firm how to advertise their using the green strategy to develop consumer interest. It is seen that environment friendly products are appreciated by European audience.
3. As compared to the cost, the gains generated will be very low in the starting, however taking the point of long run under consideration GSCM strategies are the most beneficial.
4. The cost incurred has to be imparted to the customers but it may be possible that customers are not willing to pay the extra price.

5. Lack of experts in the area who can guide the organization in the best possible way for successful implementation of GSCM.
6. No proper means of recycling which is a main component of GSCM since organizations are not designed to function the recycling.
7. Lack of adequate technology and lower funds to procure the technology required.
8. Earning trust of all the people concerned with the organization might be a very tedious task. If there is a feeling of failure amongst the employees then nothing can help them from failing.

1.3 Green Supply Chain Management in Indian context

The rapid depletion of environment by hazardous practices followed by industries is very much known to everyone. As a rapidly growing economy, India still thrives on the manufacturing sector. There are a large number of industries that play a vital role in boosting the economy of the country however it is seen that throughout the past environment has not been taken care of. The pollution index of 2019 states that India is the most polluted country in South East Asia.

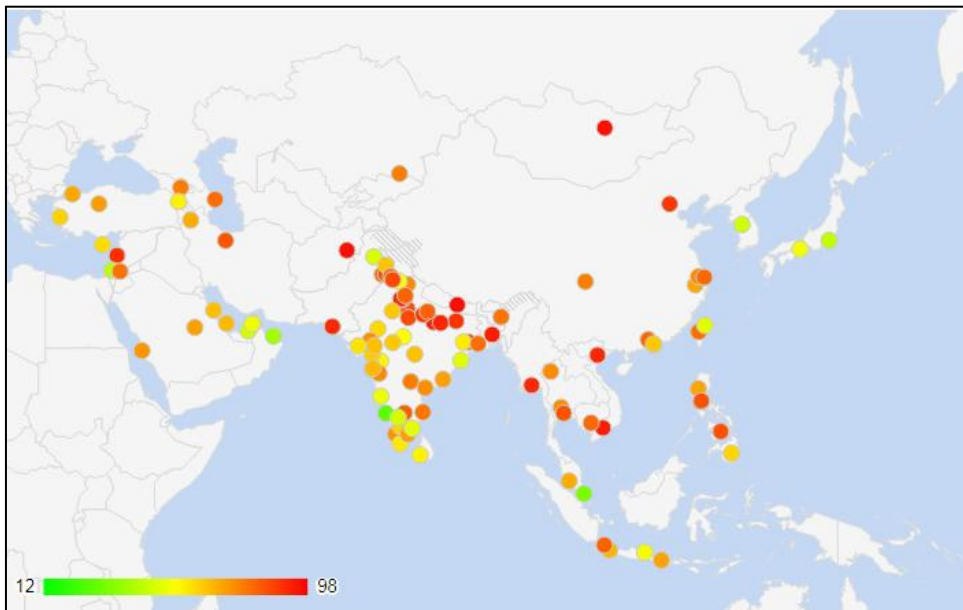


Figure 1.3.1 Pollution Index Chart (Source: www.numbeo.com)

Indian civilization has had a common upbringing methodology wherein it is preached that nature has to be worshiped. We are closely connected with the nature however the pollution aspect increasing on a daily aspect suggests that people are increasingly drawing away from their roots. There are several challenges related to such a vast population, illiteracy, poverty etc. To overcome the continuously depleting situation, several laws have been implemented.

1. Several tax exemptions have been given by the government to organizations that inculcate habits of environmental saving.

2. The judiciary of India has made regulations for the existing processes to make them more eco-friendly.
3. Since India is a growing economy, several eyes are upon it to keep a check on the pollution created by the process of industrialization. Because of this pressure, Indian government has brought about certain laws.
4. As stated above, the fact that India is a growing economy means that large quantities of fuel in the form of coal and petroleum have been used in the past, but now India has been moving onto sustainable forms of energy like wind, solar, tidal etc.
5. Thus following the above points, it has been very crucial for the firms to go in sync with the countries ideology and make changes in their system for the betterment of the environment as well as of themselves.

1.3.1 Examples of implementation of GSCM in Indian Industries

- One of the biggest companies of India, ITC, uses Elemental Chlorine Free technology, eco friendly bleaching techniques, and use of green boiler. The company is slowly moving from using exhaustible sources of energy to renewable and pollution free methods. They also extensively use recycling and by means of ITC E-choupal, they have found means to get high quality and economically feasible raw material straight from the farmers, thus benefitting themselves as well as the farmers.
- The negative impact of pharmaceutical firms on the environment is very well known of. Dr. Reddy's took the use of effective communication to propagate the need of GSCM by a process called "mentoring". Here all the senior level executives interact and important learning regarding going green is propagated. Apt training is also provided to the employees and efforts are made to incorporate all of this into the corporate culture.
- The concept of sustainability was initiated in India by the construction firm L & T. The 3 Rs of conservation have been effectively used by the firm. Rainwater harvesting is extensively carried out and 25 million liters of water is saved. All the facilities have renewable sources of energy that provide

them with alternate energy. The communication barrier is reduced by regular meetings to fill the communication gap.

- Tata group of business have always linked themselves with social causes in lieu of the vision of its founder, Jamshed Ji Nasarwan Tata. Green procurement, green infrastructure and green design are extensively used by the Tata group. Employees are regularly motivated to indulge in the habits of environment friendliness. Basic habits of saving electricity, switching off lights etc form a part. Rain water harvesting, recycling and e-waste reduction are some of the other activities.
- The State Bank of India gave rise to the concept of zero paper usage by “Green Channel Counter”. Although many new concepts related to net banking have been introduced now and the paper work has reduced by vast numbers, yet the initiative of SBI was one of the very initial works in this manner. ATMs which make use of solar energy have also been set up.
- One of the 9 Maharatana organizations of India, ONGC shook hands with MPEVS to develop a crematorium that made no use of timber. In this manner trees will be saved as well as air and water degradation.

1.4 Indian Automobile Industry

As per the statistics, Indian automotive sector has a promising future. Automobile sector boom in India came into play when business persons realized the need to increase production and this would in turn lead to higher revenues. Meaning that initially there was a consideration of the quality aspect. The rise in the competition at a large scale made it important for the firms to increase their quality by great means. Concept of kaizen was then introduced into the Indian market when ISO laid stress on quality improvement. As seen, the impact on environment was completely neglected in the quest of attaining higher quality and greater profits. Even though it being one of the greatest business areas, the heed paid to environmental aspects were extremely low. Zhu and Sarkis (2006) mentioned that the environmental issues have been paid lesser attention in economies where market is still growing at a rapid pace and is still not fully developed. When talking about scale, India has grabbed a high name for herself in the automotive sector. Now the question that arises is whether Indian automobile has paid attention to the environment damage that it is causing or may cause in the future? Even though there is ample literature available regarding automotive in India but ecological impact is still very much neglected. While several nations like China, which is our major competitor, has already implemented the concept of green supply chain, we still lag behind. There is constant increase in production capability by the Indian automobile manufacturing firms. Yet there are a very few instances that can be stated to talk about the implementation of GSCM. The primary factors here are monetary reasons. As per a report published by KPMG India, Indian automobile manufacturers are not seen going green and bring in EV anywhere in the near future unless there is an intervention by the government. Even though the manufacturers are very well developed to bring in radical changes in technology and make it green, yet they will not do so because of the low economic benefit that they will make out of it. Thus there is still a long way to go for the implementation of GSCM in automotive sector in India.

2. LITERATURE REVIEW

The amount of work done in the field of Green Supply Chain Management might not be a lot but there are a significant number of papers available that show that researchers are increasingly interested in this comparatively new area. As observed, during the 80's, researchers were just focused on the improvement of efficiency of supply chain, without any reference to the environmental hazards. True research on GSCM started in the late 90s.

According to Steve V. Walton *et al* (1998), the companies in the 1960-70 eras did not consider environment degradation as a serious problem. It was after some deadly events that the organizations started to realize the need to change habits to improve the nature and realize competitive advantage out of this. The paper also states that the organizations who implement the habit of sustainability and going green lead the other organizations into this concept as well.

Benita M. Beamon (1998) stated that for sustainability to be achieved there needs to be a reduction in the amount of waste generation and concept of reusability should be incorporated into the system. She mentioned about how the start and end process in manufacturing should be turned into a cyclic process by the re-usage of materials thus leading to lesser generation of waste. Also transforming typical supply chains to green supply chains requires changes in the way how we measure performance. Aref A Hervani (2005) talked about the accurate measurement of efficiency of the GSCM performance. He discussed inter and intra firm issues incurred during the implementation of GSCM. According to him, it is innovation that plays a key role in the successful implementation of a GSCM project. He listed out a number of metrics for the performance evaluation of GSCM. These metrics are the environmental indicators linked to the amount of effluents released during a manufacturing process.

P Rao *et al* (2005), discussed about the strategic implications of green supply chains. Using various statistical tools they found that there is a good correlation between GSCM and competitive advantage. Thus it can be rightly said with mathematical evidence that GSCM as a whole system and not in parts is very effective for a firm's performance. It

increases competitive edge and improves the economic performance. They found that if the supplies to the firm follow the 'Green' aspect the output is 'Green' as well. The green supplies or raw materials lead to a decrease in the amount of waste generated and the pollution is also minimized. Raw materials, fuels etc. are prevented from getting wasted which leads to an increased performance by the firm.

Purba Rao (2002) conducted a study on the GSCM in SE Asia. Because of the availability of cheap labor, it was found that the manufacturing industry in SEA will grow in the upcoming years however the number of organizations that work towards greening their supply chain are considerably very few in number. Rao designed questionnaire that was circulated out to companies that were given certification like ISO 9000 etc. and the questions asked were related to the consideration of environmental factors by the company. Amongst the considered data set, it was found that almost 80% organizations took into consideration the environment point of view before making any decision related to the supply chain. Using mathematical and statistical methods it was found that there was a linkage between initiative and performance of the companies that were environmentally aware. Thus it could be concluded from the study that initiative led to performance and performance led to economic gains. Hence a result was drawn out of the study that the certified companies in SE Asia were truly interested in changing their methods to improve the environmental health.

Green Supply Chain Management became an area of interest of Indian scholars in 2000s. SK Srivastava (2007) wrote that GSCM is not just restricted to being environment friendly; it also extends to having a competitive edge and generating higher profits. He drew the conclusion that companies need not worry about the initial investment and quality of the products, since implementation of GSCM is a two way profit making endeavor. Where in one we save the environment and in another we increase our own profits by reducing waste, recycling etc. He emphasized that the greatest obstacle in the path of implementing GSCM is the widespread ancient knowledge about working of supply chain which leads to a block in the mind of the manufacturer. He says that although various studies are being conducted in the area yet the studies need to be conducted at the grass root level and the scholars should

collaborate and find out ways to fill the gap since the concept of GSCM is restricted to a few research papers.

Kannan Govindam *et al* (2014) listed out the challenges faced in the process of implementation of GSCM. They listed out the barriers in the wider domain of 1. Technology 2. Outsourcing 3. Awareness 4. Monetary issues 5. Support of the management. Using the AHP methodology it was found that the barrier of technology was the greatest of all the 5. This was verified by sensitivity analysis as well. It was concluded that giving high priority to environment friendly processes is a big deal and the companies solely focus their attention on the economic benefits. Also, if some firm is genuinely interested to incorporate ecofriendly activities into their system, they still find hardships because of the high investment and lack of finances. It was also inferred that for proper implementation of GSCM, a thorough analysis of the barriers is necessary. This would in turn help to generate a check list upon which the organization should work to attain the desired objective.

S Mitra *et al* (2014) in their research found that the concept of GSCM in India is still in the very early stages. Organizations are very slow to adopt this system because of lack of technology and funding however bigger firms that have higher revenue are seen to invest in this area because of better access to resources. Lack of knowledge and awareness, and lower competition can be identified as the major avenues holding back GSCM. It is also seen that the interest and awareness amongst Indian population is not up to the mark. Since customers are not interested therefore the companies also show lesser interest in the area. Through the study they found that integrating with suppliers and building ecofriendly product design are positively correlated. However no relation was seen between the supplier cooperation and performance. It was also observed that there was no linkage between performance of a firm and the competition owing to the fact that GSCM concept is relatively newer in India. The major finding of this research was that the big shot organizations did not follow any government order to go green but it was for their own thinking and ideology that they adopted the concept of going green. It was also seen that even though the concept of closed product loop is very economic, it

is non-existent in India. However if implemented the GSCM concept can be fruitful for every stake holder of the firm.

S Luthra *et al* (2011) have discussed the barriers linked to the implementation of GSCM in the automobile sector. They found that technology, infrastructure, sticking to older methods etc. are some of the 11 barriers that were found out by the study. They identified competition, finances and lack of consumer interest to be the most important factors that prevent the implementation of GSCM. Removal of these factors can effectively result in the proper implementation of GSCM.

Sunil Luthra *et al* (2013) worked to identify the strategies for GSCM implementation. These strategies might be helpful for the organizations who wish to implement GSCM in their firm someday. They gave the first ranking to non-supply chain members. Wherein 4 strategies linked to government activities were identified.

S Luthra *et al* (2014) through extensive study of available literature concluded that of the various available themes of GSCM, development and planning of green products has a lesser impact. The study shows that consumer ended research work in GSCM is very rare and needs to be conducted. Also, the scope of involvement of top level officials plays a crucial role in the successful implementation of GSCM.

2.1 Barriers for the implementation of GSCM in Indian Automobile Sector

By extensive review of the work available, several barriers have been identified that affect the implementation of GSCM in Indian automotive industry. The following table lists out all the barriers to the implementation of GSCM.

| Serial Number | Barriers Identified |
|---------------|---|
| B1 | Low interest and involvement of top level executives. |
| B2 | High cost for the implementation of new technology. |
| B3 | Reluctance amongst the suppliers to adopt eco friendly practices. |
| B4 | Lack of willingness to change amongst the employees. |
| B5 | Lack of customer knowledge. |
| B6 | Low quality training given to employees. |
| B7 | Poor IT infrastructure. |
| B8 | Problems in the implementation of reverse logistics |

1. Low interest and involvement of top level executives: As per Mintzberg (1973), for any program to be successfully implemented in any organization, it is very important that the top level managers completely support the cause. GSCM implementation is expensive, time consuming and the benefits can be reaped in the distant future i.e. no immediate economic gains. Thus instead of locking funds in a far sighted project, the executives seek endeavors that give immediate gains. Thus the role of top level executives is of utmost importance.
2. High cost for the implementation of new technology: The implementation of GSCM involves a lot of initial investment. The cost can be borne by well developed organizations but when it comes to new startups, it is a burden. And even though several firms can easily afford the investment, yet the ROI cannot be reaped immediately. The benefits of GSCM are seen in the longer run. Because of this the investors are reluctant to invest.
3. Reluctance amongst suppliers to adopt eco friendly practices: The suppliers in India are generally not very educated. This lack of education leads them to be not

aware and interested about the eco friendly raw materials. Since suppliers form a major part of the supply chain it is very important for them to be aware about the green supply chain management.

4. Lack of willingness to change among the employees: Majority Indian population is still unaware about the drastic impacts that industrial practices can cause. Because of this, the employees who actually work at the grass root level do not find any motivation to work for something like GSCM. They perceive this as an additional work and nothing else. There is a mind block that has been always there whenever a new project is launched. Since the employees are not motivated hence they won't work in an efficient manner. Hence, this poses as a threat.
5. Lack of customer knowledge: Since Indian customers are still not much aware about the concept of GSCM, they paid no heed to the organizational policies related to it. The organizations are forced to implement a policy if consumers demand, but here in India; the consumers do not demand any green products. Thus the unawareness of the consumers is a factor.
6. Poor IT infrastructure: IT is incorporated in every aspect of assembly line. From production to after sales service, the role of IT cannot be neglected. The decision making capacity of a firm solely depends upon the MIS. This is also helpful in the implementation of GSCM.
7. Low quality training given to employees: Any new technology that is being introduced needs to be properly taught to the employees. Proper and quality training is very important and in case it is not done in a proper manner, the successful implementation of the project is at stake.
8. Problems of reverse logistics: The organizations are generally not designed for the process of recycling. If implemented properly the concept can be highly cost saving. But since the concept is not much known, hence it is a barrier.

3. RESEARCH METHODOLOGY

ISM Methodology has been used for the purpose of bringing out meaning to this research. This method is not new and has been used previously by researchers in their work. As the first step, a questionnaire was developed listing the identified barriers and Likert scale was used to rate the barriers. The respondents here were professionals working in the automotive sector having a direct interaction and in depth knowledge about the field. The form was a 7 point Likert scale ranging from 1 to 7 where 1 was strongly disagree and 7 was strongly agree. The middle ranges varied between the points.

| Serial Number | Number of records | Min. Value | Max. Value | Mean | Standard Deviation | Rank |
|---------------|-------------------|------------|------------|------|--------------------|------|
| Barrier 1 | 25 | 1 | 7 | 4.16 | 1.675310916 | 6 |
| Barrier 2 | 25 | 4 | 7 | 5.92 | 0.9092121131 | 1 |
| Barrier 3 | 25 | 2 | 7 | 4.16 | 1.34412301 | 6 |
| Barrier 4 | 25 | 2 | 7 | 5 | 1.471960144 | 3 |
| Barrier 5 | 25 | 2 | 7 | 4.88 | 1.641137817 | 4 |
| Barrier 6 | 25 | 1 | 7 | 3.68 | 1.519868415 | 7 |
| Barrier 7 | 25 | 4 | 7 | 5.28 | 0.9363047937 | 2 |
| Barrier 8 | 25 | 1 | 6 | 4.36 | 1.287115638 | 5 |

Table 3.1 Ranking the barriers

For the purpose of this research, the value of Cronbach's alpha was found to be 0.76404. The previous table shows the ranking of the identified barriers on the basis of mean and standard deviation.

| | Barrier 8 | Barrier 7 | Barrier 6 | Barrier 5 | Barrier 4 | Barrier 3 | Barrier 2 | Barrier 1 |
|-----------|------------|-------------|-------------|----------------|--------------|-------------|-------------|-----------|
| Barrier 1 | 0.1847284 | 0.129627132 | 0.397315979 | -0.02303519403 | 0.4055165007 | 0.506256272 | 0.364361391 | |
| Barrier 2 | -0.0099693 | 0.614746320 | 0.191767352 | 0.1608425596 | 0.373601611 | 0.113193793 | | |
| Barrier 3 | 0.42291850 | 0.128458906 | 0.739964749 | 0.08462188658 | 0.4633150121 | | | |
| Barrier 4 | 0.46184307 | 0.362791168 | 0.372491797 | 0.08624176948 | | | | |
| Barrier 5 | 0.49471339 | 0.51086642 | 0.301352118 | | | | | |
| Barrier 6 | 0.48732784 | 0.270543742 | | | | | | |
| Barrier 7 | 0.39691346 | | | | | | | |
| Barrier 8 | | | | | | | | |

Table 3.2 Matrix of Correlation coefficients of the Barriers identified

The Interpretive Structural Modeling:

Following are the steps involved in the ISM methodology

1. The SSIM or Structural Self Interaction Matrix: Among the various kinds of relationships that might exist between the variables under study, it becomes a necessity that a structured relationship is derived. For this, four variables are used- V, A, X, O. Here i denote the rows and j denotes the columns. Following is the description of the variables:
 - V- P_i variable impacts P_j variable.
 - A- P_j variable impacts P_i variable.
 - X- Inverse relationship between the two variables.
 - O- No detectable relationship between the performances of the variables.

This matrix is obtained manually by analyzing the possible impacts that one of the variable might hold on another.

| Barriers | B8 | B7 | B6 | B5 | B4 | B3 | B2 | B1 |
|--|----|----|----|----|----|----|----|----|
| Low interest and involvement of top level executives. | X | V | O | V | V | O | V | I |
| High cost for the implementation of new technology. | V | A | V | O | A | V | I | |
| . Reluctance among the suppliers to adopt eco-friendly practices | V | A | A | V | A | I | | |
| Lack of willingness to change among the employees. | V | V | A | O | I | | | |
| Lack of customer knowledge. | O | A | A | I | | | | |
| Low quality training given to employees. | V | O | I | | | | | |
| Poor IT infrastructure. | O | I | | | | | | |
| Problems in the implementation of reverse logistics | I | | | | | | | |

Table 3.3 SSIM

2. Initial Reachability Matrix: Next step in the process is to transform the SSIM or the structural self-interaction matrix into a table that gives out more sense. This table is called as the *Reachability Matrix* This would be done by coding the variables in the SSIM into 0s and 1s as per the binary code. The rules for this transformation are as follows:

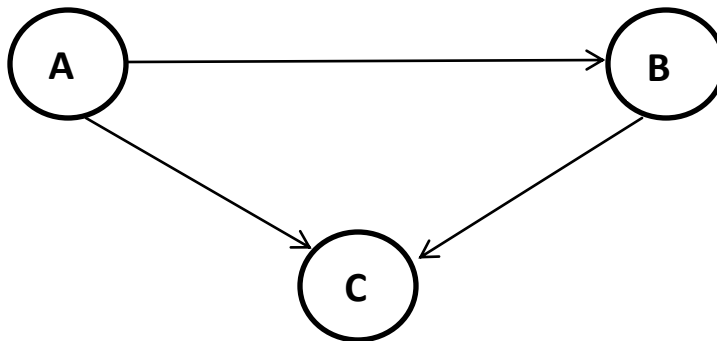
- Rule for variable V: In any entry (i,j) if V occurs, then that entry will be replaced by 1 and the corresponding (j,i) entry will be replaced by 0.
- Rule for variable A: In any entry (i,j) if A occurs, then that entry will be replaced by 0 and the corresponding (j,i) entry will be replaced by 1.
- Rule for variable X: In any entry (i,j) if X occurs, then that entry will be replaced by 1 and the corresponding (j,i) entry will be replaced by 1.
- Rule for variable O: In any entry (i,j) if O occurs, then that entry will be replaced by 0 and the corresponding (j,i) entry will be replaced by 0.

Table 4 shows the Reachability Matrix.

| Barriers | B1 | B2 | B3 | B4 | B5 | B6 | B7 | B8 |
|----------|----|----|----|----|----|----|----|----|
| B1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 |
| B2 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 |
| B3 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 1 |
| B4 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 |
| B5 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| B6 | 0 | 0 | 1 | 1 | 1 | 1 | 0 | 1 |
| B7 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 |
| B8 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |

Table 3.4 Initial Reachability Matrix

3. Final Reachability Matrix: This matrix is obtained by eliminating all the possible occurrences of transitivity in the Initial Reachability Matrix. Transitivity is the relationship given by:



This implies that given A has a relation with B and B has a relation with C, this implies that A also has a relationship with C.

This table also indicates one column comprising driving power and one row comprising dependence power. The Driving Power can be defined as the barriers that need the help of initial barrier to be fulfilled whereas Dependence Power are the barriers that are required by some barrier to be fulfilled. Thus in this table the chances of transitivity are eliminated.

| Barriers | B1 | B2 | B3 | B4 | B5 | B6 | B7 | B8 | Driving Power | Rank |
|------------------|----|----|----|----|----|----|----|----|---------------|------|
| B1 | 1 | 1 | 1* | 1 | 1 | 1* | 1 | 1 | 8 | 1 |
| B2 | 1* | 1 | 1 | 1* | 1* | 1 | 0 | 1 | 7 | 2 |
| B3 | 1* | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 4 | 3 |
| B4 | 1* | 1 | 1 | 1 | 1* | 1* | 1 | 1 | 8 | 1 |
| B5 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 4 |
| B6 | 1* | 1* | 1 | 1 | 1 | 1 | 1* | 1 | 8 | 1 |
| B7 | 0 | 1 | 1 | 0 | 1 | 1* | 1 | 1* | 6 | 3 |
| B8 | 1 | 1* | 0 | 1* | 1* | 0 | 1* | 1 | 6 | 3 |
| Dependence power | 6 | 6 | 6 | 5 | 8 | 5 | 5 | 7 | | |
| Rank | 3 | 3 | 3 | 4 | 1 | 4 | 4 | 2 | | |

Table 3.5 Final Reachability Matrix

4. Level Partition Reachability Matrix: To achieve the final structure of the model, the final reachability matrix is used. The antecedent and reachability sets are obtained from the previous step. Reachability implies that the barrier contains itself and any other barrier that may depend on it. Antecedent implies that the barrier contains itself and any other barrier on which it might be dependent. The intersection of the two sets contains the common elements. In a case where the reachability and intersection coincide, then the barriers are of highest order. Whenever there is a match between the reachability and intersection sets, a level is created. The elements of that level are then eliminated. The remaining

elements are then again made to go through the same procedure until all the elements or the barriers are placed in a respective group.

| Barriers | Reachability | Antecedent | Intersection | Level |
|----------|-----------------|-----------------|--------------|-------|
| B1 | 1,2,3,4,5,6,7,8 | 1,2,3,4,6,8 | 1,2,3,4,6,8 | |
| B2 | 1,2,3,4,5,6,8 | 1,2,4,6,7,8 | 1,2,4,6,8 | |
| B3 | 1,3,5,8 | 1,2,3,4,6,7 | 1,3 | |
| B4 | 1,2,3,4,5,6,7,8 | 1,2,4,6,8 | 1,2,4,6,8 | |
| B5 | 5 | 1,2,3,4,5,6,7,8 | 5 | 1 |
| B6 | 1,2,3,4,5,6,7,8 | 1,2,4,6,7 | 1,2,4,6 | |
| B7 | 2,3,5,6,7,8 | 1,4,6,7,8 | 6,7,8 | |
| B8 | 1,2,4,5,7,8 | 1,2,3,4,6,7,8 | 1,2,4,7,8 | |

Table 3.6

| Barriers | Reachability | Antecedent | Intersection | Level |
|----------|---------------|---------------|--------------|-------|
| B1 | 1,2,3,4,6,7,8 | 1,2,3,4,6,8 | 1,2,3,4,6,8 | 2 |
| B2 | 1,2,3,4,6,8 | 1,2,4,6,7,8 | 1,2,4,6,8 | |
| B3 | 1,3,8 | 1,2,3,4,6,7 | 1,3 | 2 |
| B4 | 1,2,3,4,6,7,8 | 1,2,4,6,8 | 1,2,4,6,8 | |
| B6 | 1,2,3,4,6,7,8 | 1,2,4,6,7 | 1,2,4,6 | |
| B7 | 2,3,6,7,8 | 1,4,6,7,8 | 6,7,8 | |
| B8 | 1,2,4,7,8 | 1,2,3,4,6,7,8 | 1,2,4,7,8 | |

Table 3.7

| Barriers | Reachability | Antecedent | Intersection | Level |
|----------|--------------|------------|--------------|-------|
| B2 | 2,4,6,8 | 2,4,6,7,8 | 2,4,6,8 | |
| B4 | 2,4,6,7,8 | 2,4,6,8 | 2,4,6,8 | |
| B6 | 2,4,6,7,8 | 2,4,6,7 | 2,4,6,7 | 3 |
| B7 | 2,6,7,8 | 4,6,7,8 | 6,7,8 | 3 |
| B8 | 2,4,7,8 | 2,4,6,7,8 | 2,4,7,8 | 3 |

Table 3.8

| Barriers | Reachability | Antecedent | Intersection | Level |
|----------|--------------|------------|--------------|-------|
| B2 | 2,4 | 2,4 | 2,4 | 4 |
| B4 | 2,4 | 2,4 | 2,4 | 4 |

Table 3.9

5. Factor Classification or the Mic Mac Analysis: The barriers identified previously are then segregated under four sections.

- *Autonomous*: These barriers have are weak on both driving and dependence power. The barriers falling under this section are not related to the area under study in a strong manner. Any link that might be visible is very weak. They are not included in the list of importance.
- *Dependent*: These barriers have low driving and high dependence.
- *Linkage*: The barriers falling under this section have the dependence as well as the driving power both on the higher side. These are very strongly related with the surroundings and any minor change in them leads to change in the other barriers. Thus these are highly unstable.
- *Independent or Driver*: This section consists of barriers that are high driving and low dependence.

The dependence and driving powers are then plotted into a graph divided into four quadrants. This method is known as Mic-Mac analysis.

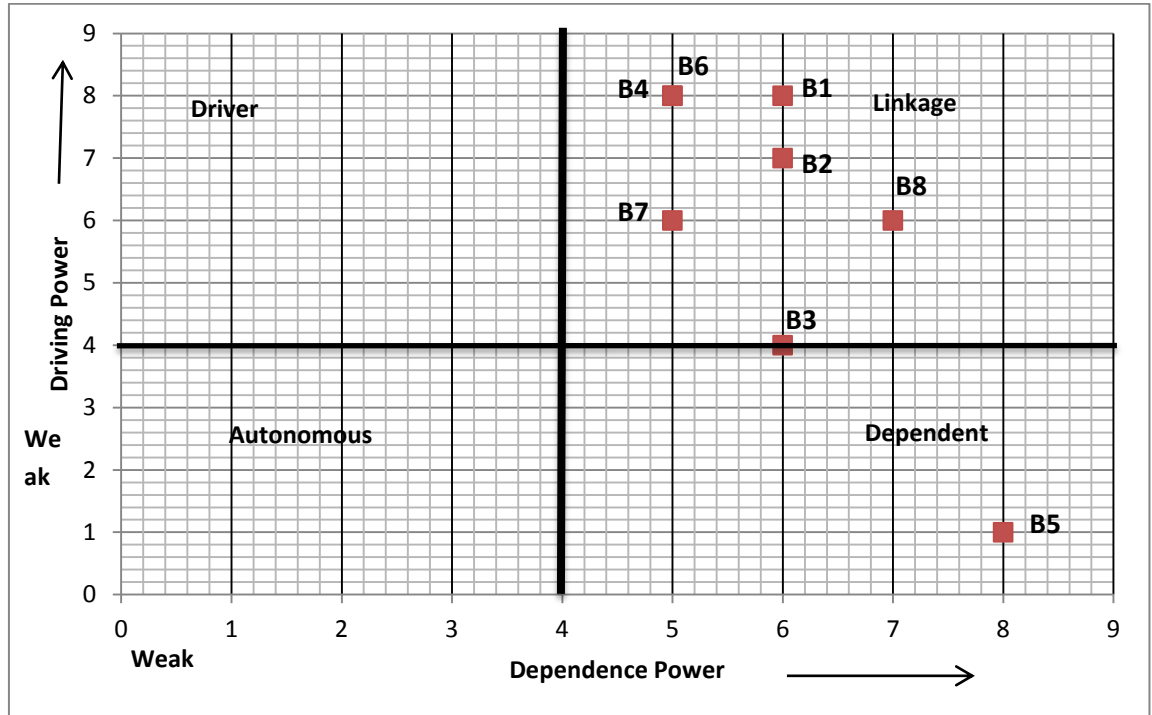


Chart 3.1

As per the Mic Mac analysis, the following result can be obtained:

| Quadrant | 1st | 2nd | 3rd | 4th |
|----------|------------|-----------|---------|----------------------------|
| Nature | Autonomous | Dependent | Linkage | Driver |
| Barriers | None | B5, B3 | None | B1, B2, B3, B4, B6, B7, B8 |

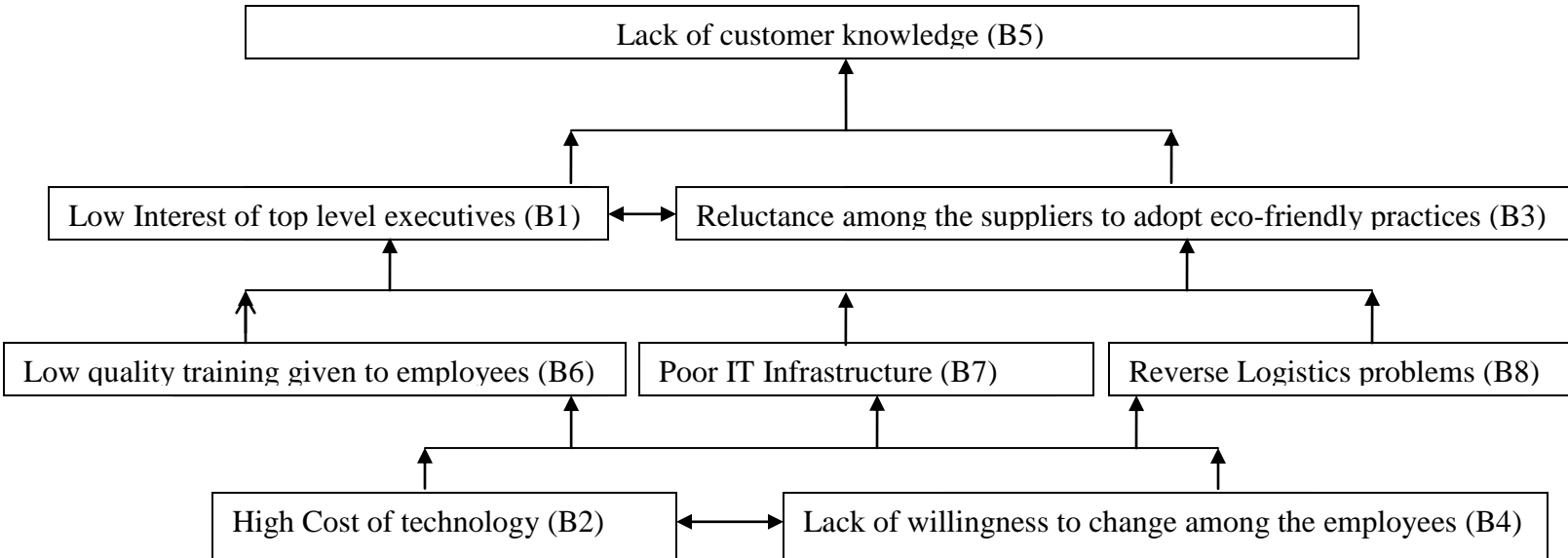
6. The Final ISM: Using the above stated means, a chart can be made depicting the behavioral dependence of the barriers on one another. Without using the method, a very complex relation between the barriers would have been there which even if plotted would not generate proper results. Thus to decipher the proper relationship from the complex web of relations the ISM model turns out to be very effective. The transitivity being removed in the previous steps, the model turns out to be almost very accurate measure to derive the relationship between collected data of the barriers. For this, a conical matrix is formulated first which helps in creating the further model.

| Barriers | B5 | B1 | B3 | B6 | B7 | B8 | B2 | B4 | Rank |
|--|----|----|----|----|----|----|----|----|------|
| 5. Lack of customer knowledge. | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| 1. Low interest and involvement of top level executives. | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 3 |
| 3. Reluctance among the suppliers to adopt eco-friendly practices. | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 3 |
| 6. Low quality training given to employees. | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 6 |
| 7. Poor IT Infrastructure | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 6 |
| 8. Problems in the implementation of reverse logistics | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 6 |
| 2. High cost for the implementation of new technology. | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8 |
| 4. Lack of willingness to change among the employees | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 8 |
| Rank | 1 | 3 | 3 | 6 | 6 | 6 | 8 | 8 | |

Table 3.10

The conical matrix very well shows the relationship between dependence and driving power.

Using the conical matrix, model showing the different levels of the barriers has been formulated. The topmost level consists of Barrier 5 which is lack of customer knowledge. The second level consists of Barrier 1 and Barrier 3 which are Low interest and involvement of top level executives and Reluctance among the suppliers to adopt eco-friendly practices. These are considered to be of great importance. Level 3 comprises Barrier 6, 7 and 8 which are Low quality training given to employees, Poor IT infrastructure and Problems in the implementation of reverse logistics respectively. The lowest level that is level 4 consists of barrier 2 and 4 which are high cost for the implementation of new technology and lack of willingness to change among the employees.



The ISM model

4. RESULT DISCUSSION

The ISM model is an effective way to analyze the factors impacting the implementation of green supply chain management since it gives rise to various levels that indicate the respective importance of the barriers and helps the organizations to classify them accordingly and work in a planned out manner. As per the conducted research, it is recommended for the senior level executives in the automotive sector should focus on the barriers in the top two levels of the interpretative structural model. The primary one being Lack of customer knowledge followed by Reluctance among the suppliers to adopt eco-friendly practices and Low interest and involvement of top level executives. These results are in sync with the literature reviewed for the successful completion of this project.

The last two levels consist of factors whose level of impact on the implementation of green supply chain management is mediocre. These factors are Poor quality training given to employees, Poor IT infrastructure, Reverse logistics problems, High cost incurred for new technology, and Lack of willingness to change among the employees.

4.1 CONCLUSION

The driving and dependence powers play a major role in identifying the responsiveness of the barriers. As discussed in the Mic Mac analysis, the quadrant is divided into 4 segments, namely- Autonomous, Dependent, Linkage and Driver. This segregation has further eased out the way in which we can list out the barriers.

- As far as autonomous factors are concerned, they exhibit a weak characteristic and are not strongly linked with the environment under study. In our study there were no barriers in this quadrant.
- There are no barriers lying in the Driver quadrant as well.
- Under linkage variable, there fall 6 variables. Thus seven out of the eight variables are highly unstable. Any change in any variable impacts the other variables.
- The dependent quadrant contains 2 variables. These variables are the most impacting variables and overcoming them will help the companies implement GSCM in an appropriate manner. Thus it means that these variables although of high importance are highly dependent on the variables falling under the linkage quadrant.
- The ISM developed is capable enough of establishing the relationship between the variables under study. The study is limited by adoption.

4.2 RECOMMENDATIONS

As per the study conducted, it was found that the major factors behind the slow progress of Green Supply Chain Management in India can be attributed to the low consumer knowledge about the concept. This factor drives the other factors of involvement of top level executives and reluctance among the suppliers to adopt eco-friendly practices.

The model just shows the relationship between the barriers. Some quantitative methodology can be used in further studies for better analysis. Also the removal of identified barriers will let the organizations develop better means of GSCM implementation.

Indian audience needs to realize the importance of going green. Even though they are now more aware about the concept of pollution and global warming, the awareness regarding business processes starting from supplier end to the packaging stage is important. Till the time consumers demand from the organizations that they need products that are completely eco-friendly, the companies will not go the extra mile.

As far as organizations are concerned, the top level management should work to incorporate GSCM in their business since the business will run only if the environmental conditions are conducive for the business as well as the consumers.

Some recommendations are made below:

1. Change in approach- Companies need to realize that the concept of implementing GSCM is not a barrier to them. It will turn out to be beneficial in the longer run.
2. Biomimicry- The use of biological engineering to create sustainable products that are environment friendly. Although it has been started in various countries, the companies in India still need to harness the concept.
3. Green Packaging- Use of eco-friendly packaging and recycling the material used for packaging will be helpful in a great way.
4. Green Stakeholders- The companies should select to serve the people and organizations that are committed to the concept of sustainability. They should

continuously keep a check on the suppliers. Also the suppliers should also keep a check on the companies who procure goods from them.

5. Benchmarking- The concept of benchmarking should be incorporated for continuous improvement.
6. Educating the masses- Lastly population plays a huge role in convincing the organizations to inculcate some drastic steps. A properly educated population is an essential part required to incorporate the practices of GSCM.

Thus going green is not a small objective that can be achieved in a few months. Organizations and consumers need to understand the need to make it the aim of the longer run. For this, time and efforts are required. And not only in India, but across the globe companies need to focus on their system. With continuously rising pressure and adoption of eco-friendly laws by governments of several nations, it is hoped that the organizations will very soon incorporate green practices into their supply chain.

4.3 LIMITATIONS OF THE STUDY

1. Sample bias-The selected target respondents were sent out a survey which they were required to complete. However the scope of audience was not appropriate because of the geographical barriers present.
2. Less sample size- Only 25 respondents could be gathered who were interested in genuine participation. A larger sample size would have generated better and more accurate results.
3. Insufficient Literature- The work done in the area of Green Supply Chain Management in Indian context is very limited. Thus there was less material that could be referred. The work conducted here related to barriers in the automobile industry is limited. Thus adoption presents to be a limitation.

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