THE STUDY OF SUPPLIER SELECTION CRITERIA FOR EMERGING SUSTAINABLE GREEN SUPPLY CHAIN MANAGEMENT

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Abstract: *The World is moving faster with the new technological development. Supply chain management is flow of information, product, finance, knowledge in upward and downward direction from vendor and customer. Now a day's people are more concern about the environment. For sustainable development business are moving towards concept of green ie green product, green practices. In this, businesses are operating on the produces which cause less harm to the environment and gain competitive advantage. With the help of systematic and integrated approaches for doing business this sustainable practise can be adopted. It has been found from different literature review selection of green supplier is the most important issues while developing green supply chain management and improving environmental performance. This study tries to find out the factors of green supply chain management and criteria for selection of supplier for achieving green supply chain practices.*

Keywords: **Technological development, Supply chain management, green product, green practices, sustainable practise**

1. INTRODUCTION:

In manufacturing industry there are two types of procurement strategies used 1st is single source supplier in which raw material is procurement from the single supplier and 2nd is multiple supplier in which there are more than one supplier who are provide material the for the manufacturing of the product. To gain competitive advantage you cannot reply on the only one supplier since some time he may not give the product on times. So if you have multiple suppliers it will be easy for manufacturer to achieve operational efficiency and utilization of resources can be done in proper way (Alyanak & Armaneri, 2009). This is essential to keep more than one supplier since one supplier alone cannot full fill customers requirement, along with this manufacturer must keep in mind to go for green Supply chain practices as far as concern for the environment and to gain competitive advantage.

Green supply chain management can be defined for integrated supply chain management approach in the industry including design of process, procurement of raw material, selection of supplier, and its delivery to the customer and end of life of that product after its usefulness to the customer ie reverse logistics or reverse engineering. Manufacturer can recycle the product of the end of life of product so that operational, environmental efficiency can be achieved. This facility of GSCM includes recycling of the product which minimizes wastes, garbage, saves money resources. This practice improves the environmental health and environmental degradation. This can be possible only if the supply chain partner is efficient who can manage the resources, product, and post service of product to the customer.

India is the country of large population which is 2nd in the world. Customer's demands are changing day by day and with the large population huge waste is generated though out the day. If channel partners are manged with the great efficiency in the chain then sustainable green supply chain can be achieved. This study is focusing on the green supply chain management with respect to India and supplier selection criteria for effective supply chain management. For evaluating GSCM practices and supplier selection literature review are used.

2. LITERATURE REVIEW

In last two decades various research papers had published by the researcher in which they have identified different issues related to the supplier and supplier selection.

Traditional supply chain management

There are many success story of different companies who are excellent in the SCM and different studies which shows how firms performance are best in class with the help of benchmarking. SCM is influence from logistics and transportation management which further uses the concept of distribution management, operations management, marketing, as well as procurement and use of IT tools. All these things are in combinable use to enhance the firm's performance (Wisner and Tan 2000, Croom et al. 2000). Basically SC integration has 6 different Era in the evolution of SCM and these concepts are evolved in 1980.

The main objective of SCM is to maximize overall value in the operation, faster delivery and improved quality of services without compromising the quality to satisfy customer needs. SCM consist of integration of actions that purchase resources, transform them into extreme goods and final products, this all activities are held before delivering them to customers (Render and Heizer, 2001)

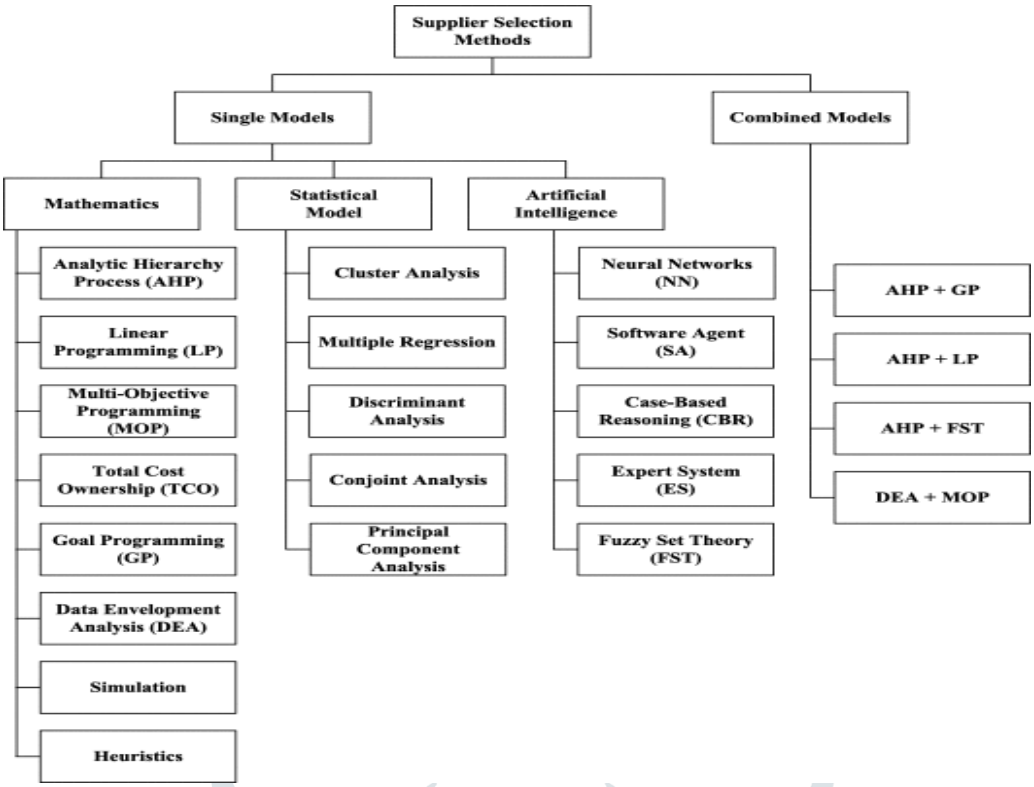

Figure 1: Analytical existing criteria for supplier selection

2.1 Green Supply Chain

The literature of GSCM has focused on to introduce green practices or acquire certifications or to the existing suppliers which will help in improving their environmental performance. This Supplier selection in green supply chain management will make significant impact on procurement decisions. To achieve the environmental performance through GSCM many research scholar have studied the parameters for the green supplier assessment. A model was suggested (Roy and Whelan 1992) that shows the human can reducing waste which generate from the electronics without affecting or making harm to environment. Rating for green supplier was suggested by AHP in their Model (Noci, 1997). AHP based purchasing decision was suggested with the utilization of Delphi method by asking expert opinion to the environmental expert Handfield ET. al (2002). For six-dimension planned strategic decision framework for Green Supply Chain management Sarkis (2003) utilized ANP. New supplier selection as ANP was presented by Hsu and Hu (2009) for the hazardous material

And its management including capability of green design, green materials recording & coding, green purchasing, inventory of unsafe substances, management for harmful substances, legal compliance and system for environmental management. For high-tech industry Lee et al. (2009a) has given criteria for Green supplier management i.e. quality, capability, environment management, technology, pollution control, green products and competencies.

2.2 Green and Traditional Supply Chain Management Difference

Traditional supply chain is basically focused on the liner flow of information and material throughout the chain which focuses on the reduction of total cost but it has no concern for environment whereas green supply chain management consider environment and it is designed to achieve operational and financial efficiency without affecting the environment.

Sr. No.	Particular	GSCM	Traditional SCM
1	Objective	Ecological benefit and environmental concern	Financial Benefit and no concern for environment
2	Criteria for selection of supplier	Long term for gaining ecological benefit	Short term for gaining financial benefits
3	flexibility	less	Higher flexibility
4	Cost of operation	High	low
5	highlight	Reverse logistics and recycling of the products	Focus on the cost benefits and not involve sustainability

Traditional supply chain management consist of inward and downward flow of material, information, finance of material and components of supply chain management are

Supplier/ vendor/ raw material provider

Manufacturer

Distributor/wholesaler/ retailer

Customer

2.3 Redefining traditional SCM

It also consists of all the component of traditional SCM. Industrial development and protection of environment are the major challenge in the development of Sustainable green SCM. Since world is changing rapidly and customers demand are changing. To stay in competition companies are trying to optimize their operation as per the market demand. To achieve environmental sustainability and development reduction of waste and proper utilization can be done by redefining traditional supply chain. Refining of SCM is the process of taking action on every step or component of SCM which causes harm to the environment and redefining the process. Basically doing reverse logistics or recycling of the product and process will help to use good part after end of the life of the product and which will impact on saving natural resources since less new inventory will be required for new product development.

2.4 Green Supply chain Management.

For achievement of environmental sustainability though SCM can be achieve with the adopting green business practices by supplier, manufacturer and retailer. Since world is moving toward go green concept. Everyone is trying to minimize losses to the environment by adopting the practices which do not harm the environment

Select the process or services i.e. transportation, manufacturing, usage, recycling and reuse of the working component of product which are causing less negative impact on the environment. Many counties in the world are using eco-friendly product for the use.

Companies should adopt the green manufacturing practise which involves less emission of gases which are causing the harm the environment and help in reduction of carbon foot print also the use of less raw material resources without affecting quality of production. Less waste and gain production efficiency and improved image of company the market.

For distribution of product, it relates to the logistics and packaging of the product. This logistics is inbound and out bound. Packaging of material is material use, size, shape and its impact on transportation and distribution. Use of space in the transport, handling of material, quality of the material use for packing these things need to be consider.

If manufacturer accept the product which is already shipped by him and use that product for recycling wherever is possible.

Currently world is suffering from the problem of e waste. The electronic devices and other household appliances including computer, mobile phone etc. which have end their life and no longer fit for use these products are e wastes. This e waste contains more than 1000 different substances and they are non-decomposable and hazardous for environment and social well-being. This e waste can minimize by recycling of product and analysis of life cycle of the product.

3. OBJECTIVES OF GSCM

1. To identify the significant difference between traditional and GSCM
2. To study GSCM for achieving environmental sustainability
3. To learn green supply chain management practices which causes less harm to environment and utilization of less resources(natural)

3.1 Selection of supplier criteria

Researchers were studying performance of supplier and selection criteria for supplier selection as focal point for their research since 1960. In Traditional SCM the focal point for supplier evaluation was revolved round the financial aspect and decision was made by looking at financial aspect (Narasimhan and Talluri, 2007). In research it was found that cost and price was not widely adopted criteria for supplier selection but delivery quality and cost are the most famous criteria for selection of suppliers. From this it implies that the traditional approaches SCM for single criteria i.e. price/cost is not helpful and robust. The world is customer driven and they focus on the quality, flexibility and timely delivery of product as per their convenience so the cost based traditional SCM approach is not suitable for global environment for supplier selection (Ho et. al., 2009). From the survey study **(**Shu and Wub, 2009) value added capacity, quality, cost, flexibility, timely delivery, culture, reputation of service provider, location plays important role in supplier selection. Delivery and performance history of supplier also plays important role in supplier selection (Chaudhry et. al. 1993; Talluri and Narasimhan, 2003). 74 articles available from the 1966 related to supplier selection were studied by Weber et. al. & from the study analytical methods, techniques were used for selection of supplier.

3.2 Green supplier selection criteria

Selection of supplier involves both intangible and tangible component depends on the type of product and data use for this is both quantitative and qualitative. Basically judgement method is use for selection of supplier in SCM. GSCM started from the design of new product till the end of life of that product. This design criteria involves reduction of waste from the process, reuse of material, reduction of cost without affecting the quality of services or product. In manufacturing process the aim is to minimize the hazard to the environment by reducing material, energy , setup time, cost, reuse and minimum use of natural resources, reengineering of business process, information sharing, use of technology and research and development for innovation for green manufacturing practices.

Green logistics:

Logistics in simple language can be defined as movement of material. In this process one must take care about the sustainable process of handling of material, its transportation, storage in warehouse, packaging and inventory control method.

Customer service:

Post service of product customer care support, warranty, guarantee, response time for complaint, certification for the quality these things are taken into consideration for customer service criteria.

Environmental management : use of material , recovery, reuses, recycle, use of ISO14000 certification , emission of bi product which cause harm to environment should be taken into consideration when it comes to environment management criteria.

Procurement management criteria: inventory control, green purchasing, eco-friendly product, supplier management

Operational performance: legal compliance, auditing, inspection. Research and development for innovation, level of inventory reduction, scrap reduction, go green policies for products, delivery of product on time, utilization of resource in products green auditing.

Customer co-operation: less energy consuming products, packaging of product is biodegradable, asking customer for using recycled products**.**

Along with this below are the some key points for green SCM or criteria for Supplier selection

1. Redesign of product for its size and shape, use of improved design, use of recyclable products, improvement of packaging of product for shipment and planning of post end of life of the product.

2. Use of fuel efficient source for the transport of material, eco-friendly logistics, sharing of resource, use of renewable resources as fuel due to which low emission of harmful gas can be achieved.

3. Warehouse should be properly arranged so that time of search for product and optimum use of space can be done for this one must focused on improvement of layout design. Also war house location should be chosen strategically so as to reduce the total cost of transport and carbon footprint can be minimizes.

4. Collaboration, enterprise extension, integrated service provider, cash spin, dwell time minimization should be done for improvement in SCM.

5. Redefine routes of transport and loading and unloading pattern of shipment. Also use mix mode of transport for distribution and shipment.

4. CONCLUSION

Due to changing demand of customer and to gain competitive advantage in the market it is not beneficial to stick to the traditional SCM concept. It is complex; time consuming and costly plus this affect enviorment.so to survive in the competition and to make economic and ecology profit business should adopt the GSCM since the aim of business in current situation is not limited to only production and distribution to customer.

Everyone is talking about green, environmental sustainability so it not limited to only production it also enforces business to shift their transportation, distribution, planning strategy to be eco-friendly and life cycle of product is key aspect while designing the product and its disposal after end of life. After studying different literature and other data it can be concluded presently analysis and design of SCM is more focus on the green supply chain management with compromising quality, reduction of cost, flexibility and timely delivery to the customer. So supplier can be selection depend on the product and need context. So the new supplier selection can be done on the criteria of continuous improvement and environmental loss analysis. By doing this loss can be minimizes and business can achieve profit in finances and operation without harming environment and sustainable green SCM can be achieved.

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