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**Identification of Stimuli, Enablers and Inhibitors of Green Supply Chain
Management and an Analysis of Their Dynamics**

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Abstract

The trend towards developing green supply chain (GSC) is increasing owing not only to the innumerable environmental damage caused by the supply chain processes and the pressure from the various regulations and laws brought forward by the government, but also the commercial gains and competitiveness achieved by taking up Green Supply Chain Management (GSCM). Various viewpoints, scopes as well as approaches for implementation of GSC processes have already been discussed in previous literatures. This paper addresses the three forces Viz. stimuli, enablers, and inhibitors that play key roles in implementing, managing and controlling GSC, and explore the relationships between them. An attempt has also been made to develop a conceptual framework to manage GSC.

Keywords: Green, Sustainability, Green Supply Chain Management, Stimuli, Enablers, Inhibitors,

1.0 Introduction

Organizations have been concentrating on improving supply chain (SC) visibility and refining efficiency and effectiveness, however in the recent years, environmental management in the SC has been receiving increasing attention among researchers and practitioners. Various human activities are causing raw materials to diminish, waste sites to overflow and pollution levels to increase drastically. The SC processes are considered to be such related activities. They degrade the environment and take away earth's capability to compensate and recover (Beamon, 1999). To reduce resource depletion and waste generation a number of steps need to be taken towards being environmental friendly. But organizations have to note that it is not just about protecting the environment, it is also about good business and increasing profits (Srivastava, 2007).

There has been widespread concern over GSCM, especially due to environmental and consumer interest groups (Fiksel, 1996; Beamon, 1999). Organizations are facing competitive and community pressures along with environmental legislations and regulations enforced by the government. As a fact, they are being forced to balance both economic and environmental performance (Shultz and Holbrook, 1999; Zhu et al., 2004). In practice, the GSCM helps to keep this balance. However, it should make sure that profits are achieved, environmental risks and impacts are lowered and ecological efficiency is raised in business (Van Hock and Erasmus, 2000; Zhu et al., 2004). Several organizations have proved that there is a link between improved environmental performance and financial gains. The companies like IBM, HP and Xerox have already undertaken a number of measures by integrating corresponding suppliers, distributors, and reclamation facilities in order to green their SCs (Ashley, 1993; Bergstrom, 1993; Maxie, 1994; Sheu et al., 2005). Leading electronic industry companies like Dell, HP, Motorola, Sony,

Panasonic, NEC, Fujitsu and Toshiba have adopted GSCM as a business strategy (Zhu and Sarkis, 2005; Sheu et al., 2005). Some of these organizations are also enhancing their competitiveness through improvements in their environmental performance (Bacallan, 2000). It can in general be noted that organizations are finding cost saving by reducing the environmental impact of their business processes by re-evaluating their entire SC from green perspectives.

In the literature revisited the definition and scope of sustainability in the SC is a large. It covers the concept of green purchasing (Zhu and Geng, 2001; Srivastava, 2007), green design (Chen, 2001), production planning, control for remanufacturing and product recovery (Guide and Wassenhove, 2001; Guide et al., 2003), reverse logistics (Carter and Ellram, 1998; Fleischmann et al., 2001; Zhu and Sarkis, 2004), closed loop SC(Guide and Wassenhove, 2006a; 2006b), design of the green logistics network (Jayaraman et al., 2003) and sustainability integration along the SC (Srivastava, 2007). It is very clear that the scope of the GSCM has been expanding. It moves from reactive environmental management programs to more proactive practices (Srivastava, 2007).

A lot of research has been on the GSCM, though it is still difficult to implement and take economic benefits of the same. The foremost reason is the existence of different types of forces in the SC environment. This article in particular discusses three types of forces viz. stimuli (driving forces), enablers (green measures or initiatives) and inhibitor (the factors that inhibit or impede the progress of GSC), and describe a conceptual framework to implement GSC through various steps.

2.0 Understanding GSCM

The SC is all those activities associated with the transformation and flow of goods and services from the sources of materials to the end users (Bowersox and Closs, 1996). Adding the “green” component to SCM integrates environmental management with SCM that addresses the influence and relationships of SCM to the natural environment (Hervani and Helms, 2005; Srivastava, 2007). It is therefore not surprising that GSCM finds its definition in SCM.

Many authors have defined GSCM in various ways keeping a different perspective in front. Green et al. (1996) addressed GSCM as the way in which innovations in SCM and industrial purchasing may be considered in the context of the environment. Narasimhan and Carter (1998) stated that environmental SCM consists of the purchasing function’s involvement in the activities that include reduction, recycling, reuse and the substitution of materials. Godfrey (1998) explained GSCM as the practice of monitoring and improving environmental performance in the SC. Srivastava (2007) integrated an environmental thinking into SCM, including product design, material sourcing and selection, manufacturing processes, delivery of the final product to the consumers as well as end-of-life management of the product. Seurind and Muller (2008) defined GSCM as a clear strategic and integrated thinking to achieve economic, social and environmental objectives of business. Therefore it is more appropriate define GSCM as “managing SC for benefitting human being i.e. satisfying present and future needs along with preserving or conserving environment resources”.

GSCM scope lies in green purchasing, empowerment of employees, customer focus, continuous improvement, working towards zero waste, life cycle analysis, and green marketing (Rao, 2002; 2004). There is a need to convert the one-way SC to a closed loop which improves the

environmental performance of the SC (Hasek, 1997; Sarkis, 2003). This closed loop can include SC operations designed for end-of-life product and packaging recovery, collection, and re-use by implementing methods like recycling and remanufacturing approaches (Beamon, 1999). Reduction in energy usage and waste generation should be done throughout the SC (Sarkis, 2003). The list is very long and GSCM is everyday spreading into various other sectors with organizations coming up with new strategies in their quest to be green.

3.0 Essential of managing GSC

The rapid growth in industrialization has led to an increase in production and consumption of various goods. As a result, there has been considerable amount of damage to the society and environment including depletion of natural resources, wastes generation during production, rising transport emissions and congestion, non-disposability of goods at the end of their product life-cycle, and stressful work environment for employees (Hussain, 2011). It is, therefore, essential for organizations to implement GSCM because of the relative scarcity of resources and the potential pressure of green barriers (Zhu et al. 2005). Organizations have a number of reasons for implementing GSC policies, from reactive regulatory reasons, to proactive strategic and competitive advantage reasons. GSCM promotes efficiency and synergy among business partners and their lead corporations. It enhances environmental performance by reducing waste and lowering a load on environment. It also enhances the corporate image upholding the brand reputation, competitive advantage and marketing exposure of the organization (Rao and Holt, 2005; Khiewnavongsa and Schmidt, 2008). In GSC, there is practically less rejects for supplier and it is easier to manufacture for producer. As a fact, it has effect on costs such as lower cost prices for supplier, lower cost for producer, and lower cost of ownership for customer. GSCM has further helped organizations to reduce environmental risks and impacts, and also to

improve ecological efficiency. As a result, it has turned out to be the key to achieve corporate profit and market share objectives (Zhu et al, 2007; 2008). However, organizations should balance their economic performance and environment performance and they should have strong focused leadership for providing necessary resources (finance and manpower) that lead to green SC.

4.0 The various forces and their dynamics in the GSC

Companies do not often change their business processes that allow inefficient processes to continue unabated causing unnecessary waste and pollution. There is rising concern over the environment, however it is considered that waste and emissions caused by the SC have become the main sources of serious environmental problems including global warming and acid rain (Bloemhof-Ruward et al., 1995; Sarkis, 2003). Therefore, greening the SC is an utmost requirement. However, it is often difficult to realize the requisite amount of greening of the SC owing to a number of dynamic forces in the SC. There are three such dynamic forces, namely stimuli, enablers and inhibitors, and the study of each of these three is vital.

4.1 Stimuli

There are a wide range of factors that can persuade an organization to extend sustainability management criteria and practices to its SC. In sustainable SC, these factors are called as stimuli are the elements which may be embodied in the form of a sustainability needs, requirements, changes, challenges, issues etc. and may be related to any segment of the SC. The stimuli may force the partners of the SC to take some actions to respond to changing business environment in order to streamline sustainability operations or processes of the SC. The presence of stimuli may further vary performance of the players in a SC. Hence, they are the real drivers that encourage

the organizations to go green. From the past research works on green concerns, we have been able to list down a number of stimuli associated with GSCM as shown in Table 1. All the stimuli may not come under the range of management control and, thus, it is required that they are identified and categorized properly. Broadly they can be categorized into two viz SC related and environment related. For example, in the environment domain, there are a number of stimuli, namely, reduce air pollution, reduce depletion of natural resources, increased effort to reduce

Table 1 A list of GSCM stimuli

	Stimuli
Environment related	Reduce air pollution/ carbon emission
	Reduce water pollution
	Reduce solid waste
	Reduce energy waste
	Reduce consumption of hazardous/harmful/toxic materials
	Reduce frequency of environmental accidents
	Improve enterprise's environment
	Reduce depletion of natural resources
	Increased effort to reduce carbon emissions
SC related	Reduce cost of processing (materials purchasing, manufacturing, packaging, distribution etc.)
	Reduce cost of energy consumption
	Reduce cost of waste treatment and disposal
	Reduce fine for environmental accidents
	Scare resource
	Reduce rejection and scrap rate
	Improve products' quality from environment point of view
	Increase product life
	Improve capacity utilization
	Improve health, safety of employees
Others	Stronger governmental regulations (ILO, GATT, WTO, EU, national laws)/ National green regulatory compliance
	Investor's demands for SRI, DJ Sustainability Index etc.
	Global environmental legislations
	Pressure regarding environment, health and safety from society/consumer to go green/market pressure to buy green products
	Organizations focus on corporate social responsibility activities
	Government subsidy to the green initiatives

energy use, etc. In the domain of sourcing or procurement, the stimuli could be non-availability of raw material, high inbound transportation and packaging costs etc.

4.2 Enablers

The various stimuli force the different segments of and players in the SC to take up actions that respond to and overcome the stimuli. These actions or initiatives from green perspectives are called enablers which may be tools, techniques, practices, mechanisms, methods, and related strategies that enable and promote green initiatives in the SC. They attempt to improve the green performance measures throughout the entire SC. GSCM involves traditional SCM practices, which integrate environmental criteria or concerns into organizational decisions related to SC processes like purchasing, manufacturing, distribution, warehousing, packaging etc. and long term relationship with SC stakeholders. From the past literature on green, a number of enablers are identified as shown in Table 2. The enablers can be categorized based on their position in the different segments of the SC, however, here an attempt has been made to categorize these enablers into process, product, human resource, collaboration, environment and technology related. For example, environment related enablers are ‘reduce waste’, ‘decrease or eliminate the use of potentially hazardous substances’, ‘eliminate all classes of ozone depleting substances’, ‘managing for eco-efficiency’, etc. Moreover, in the domain of sourcing and procurement the enablers could be ‘selection of green suppliers’ who have minimized their environmental impact without reducing the quality of the product or significantly raising costs. Moreover, the key business practices that came out in the literature over the last decade are green design, green operations, green logistics, waste management, green management etc.

Table 2 A list of GSCM enablers

Group	Enablers	Group	Enablers
Environment Related	Manage for eco-efficiency (Pollution prevention instead of pollution control)	Products Related	Design of products for reduced consumption of material/energy
	Reduce waste and disposal		Design of products for reuse, recycle, recovery of material, component parts
	Decrease or eliminate the use of potentially hazardous substances		Design of products to avoid or reduce use of hazardous products and/or their manufacturing process
	Proper disposal of waste		Eco-design
	Eliminate all classes of ozone depleting substances		
Process Related	Product stewardship	Collaboration/ cooperation related	Design refurbished products
	Re-assembly		Coordinate with SC player and/or end-consumers for eco design, cleaner production, sourcing, packaging, distribution, reverse logistics etc.
	Repair		Coordinate/ collaborate with suppliers for designing and developing green products
	Reverse logistics	Technology Related	Cooperate with members of reverse logistics channels
	Product recovery		Pollution control technologies (installing equipment on the end of a process, discharge stack or effluent pipe)
	Process modifications		Use of waste treatment equipment
	Remanufacturing		Use of latest technology like IT, automation etc.
	Recycling		Facilities retrofitting (e.g. energy conservation from the ventilation system)
	Re-use		In-store displays and labels (advertising)
	Redesign manufacturing equipment to reduce waste		Giving out free samples of recycled, refurbished items
Green processes	Form green initiatives team		
Eco- labeling	Government subsidiaries		
Resource	Seminar to customers to buy environmentally friendly products	Others	
	Educate consumers-Point-of-sale demonstrations and knowledgeable salespeople		
Human Related	Employee training for awareness about green and minimize spills		

4.3 Inhibitors

Organizations can take number initiatives as explained above for greening their SC in order to improve green performance measures. But there are certain elements, internal or external, which hinder progress of the sustainability initiatives at the level of a particular segment or the whole SC. These elements identified as inhibitors impede the green progress which the SC may otherwise achieve. The presence of these elements causes the managing and controlling of the operations very difficult and, thus, they are counter-productive. From the past literature on GSCM a number of inhibitors are identified as shown in Table 3.

Table 3 A list of GSCM inhibitors

Inhibitors	Inhibitors
Complexity in designing green SC	Lack of training to implement green initiatives
No compromise by customers on traditional product attributes, such as convenience, availability, price, quality and performance.	Lack of knowledge regarding national legislation on being green
Difficult to repair	Lack of management commitment
Difficult to recycle or remanufacture	Lack of a green supplier and SC network
Less return on investment/Risk of capital investment	Lack of reverse flow or logistics
Lack government subsidy	Lack of societal requirements for green initiatives
Lack of appropriate company's policies towards green initiatives	Organizational governance structures
Lack of resources (finance and human)	Lack of awareness about environmental issues
Lack of performance metrics and audit	Lack of expertise for implementing green initiatives
Lack of knowledge regarding green initiatives	Lack of supporting technology

4.4 The dynamics of three forces

Owing to the three dynamic forces, it often becomes difficult to realize the requisite sustainability in the SC. Therefore, it is vital that we must understand the dynamics of them. In

the SC, the stimuli are the main driving forces that initiate the need for sustainability. A stimuli may influence certain segments of and various players in the entire SC and it may propagate across the chain demanding sustainability. The stimuli may be of internal or external type (Hervani and Helms, 2005). The internal stimuli may be the results of the inefficiencies lie in some portion of the SC itself whereas the external stimuli are related to external environment of business like customers, competitors, markets etc. The sustainability in the SC may be enabled by various ways depending on the type and nature of stimuli. One can use more than one enablers to achieve the motives and overcome the stimuli. Nowadays, sustainability is being achieved at almost every stage of the SC and, thus, enablers are present in almost all the stages. The third dynamic force is the inhibitor. The inhibitors hinder the progress of sustainability enablers or initiatives and may be in an internal or external environment. All the three forces are present in the domain of the SC and each of them has different types of influence it. In other words, they exert different kinds of pressure on various players and processes in the SC. The dynamics of these forces therefore have to be studied properly to prevent the risks of sustainability failure. The sustainability failure or lack of green initiatives may put organizations into a questionable position since they are not only accountable for the emissions and effluents created by their SC processes but also for the environmental impact of their products throughout their lifecycles (Rao, 2004).

Internal pressure for GSCM is a largely cost and profit driven (Letícia et al., 2010). Waste streams, costs for disposal and the overall waste and excess from not recycling drive the needs. Internal controls may be related to all forms of activities, processes and actions and practices that may influence a firm's decision to adopt innovative practices. Many of these innovative adoptions may lead to improvements in environmental outcomes and overall business

performance (Letícia et al., 2010). Moreover, two organizational factors viz. organizational resources and capacity along with organizational monitoring play an important role in a firm's adoption of sustainability practices (Florida et al., 2001).

There are a number of sources of external pressures for GSCM. Pressures can either be from the government in the form of regulations and laws or from market which includes influences by numerous stakeholders such as communities, employees, customers, suppliers and competitors. A market may result in an environmental innovation to be initiated in the SC. The pressure to innovate from an environmental perspective may also come from regulations and laws as firms respond in creative and dynamic ways to an environmental regulation by introducing innovations that improve environmental outcomes. Moreover, many of these external concerns and pressures can be traced to corporate legitimacy issues. These pressures may vary industry to industry and may depend on the sizes of organizations (Henriques and Sadorsky, 1996; 1999).

There are other external pressures do exist and include environmental compliance, liability, issues of business continuity, the call for benchmarking to national, international, or industry standards, customer attitudes toward product take-back, and even pressures from inter-organizations (Hervani and Helms, 2005). Moreover, organizations require appropriate structures to enable both assessment and application of internal and external measures. There is also a need for internal absorptive capacity or the capacity to accept change and modify or adapt operations at various levels to external or internal shocks (Letícia et al., 2010).

The GSCM practices are giving positive environmental performance. Many researchers suggest that there is a link between GSCM practices and positive economic performance. However, in the SC with multiple players whether regionally or globally dispersed, performance measurement

is a challenging task because it is difficult to attribute performance results to one particular entity within the chain. Thus, by properly managing the dynamics of the three forces, the benefits of synergy and the productivity advantages could be obtained. As a fact, GSCM has emerged as an important new archetype for companies to achieve profit and market share objectives by lowering their environmental risks and impacts while raising their ecological efficiency (Van Hock and Erasmus, 2000).

Here, an attempt has been made to present a simple schematic view of the dynamics among the three forces as shown in Figure 1. Here, the squares, blocks, circles and links represent drivers and sources of these three sustainability forces. However, suitable analytical and systematic models and frameworks supported by information technology are more useful than have not been put to use here due to its complexity and high cost.

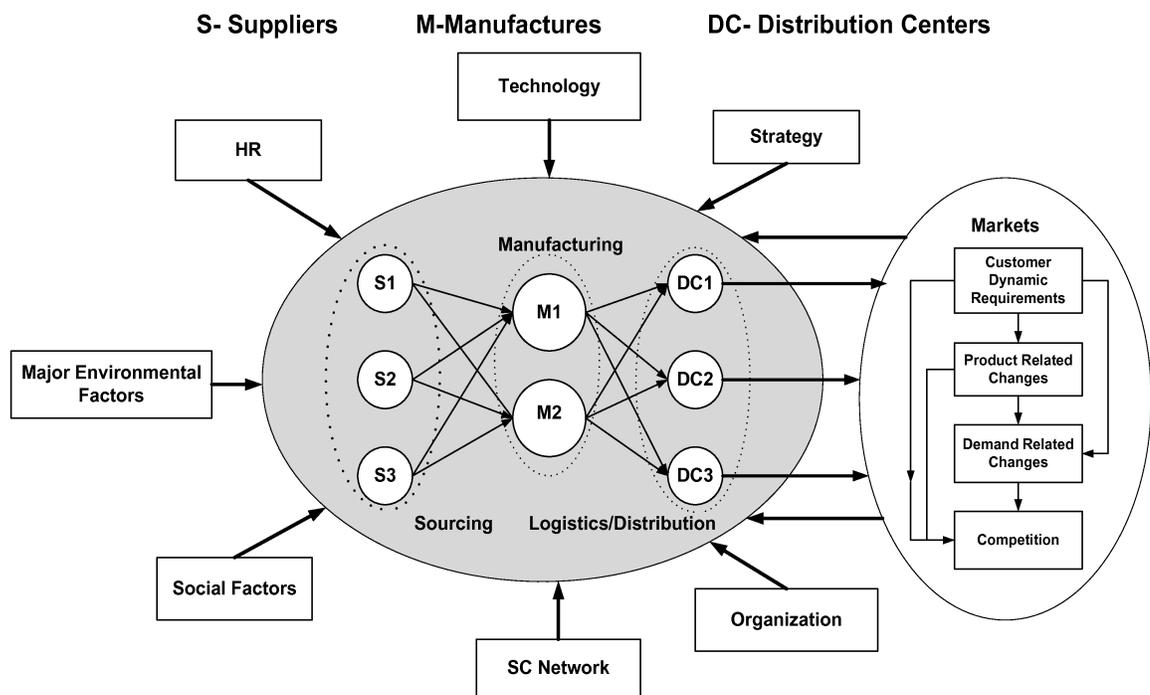


Figure 1 The dynamics in the GSCM

5.0 Conceptual model of GSCM

In the past literature, there are very few conceptual models on GSCM for managing, controlling, improving and assessing sustainability in the SC. Taking into accounts, all the aspects related to GSCM, a similar attempt has been made here to develop a conceptual model of GSCM as shown schematically in Figure 2. There are ten sub systems in the model depicted by labels 1,2,...10. The first sub system is the identification of GSC stimuli. The stimuli are embodied in the form of sustainability needs, requirements, changes or challenges of the partners or external business environment and may be related to the product, competitor, customer, SC partner, technology and operations and processes of the SC. These elements may force the partners of the SC to take actions to respond to changing business environment in order to streamline operations or processes of the sustainable SC. At each segment, the stimuli create an awareness of the need for sustainability (sub-system 2), whereas at SC level, strategic intent to become green needs to be considered (sub-system 3) that can be set looking at a long term perspective of business. Here, a company should look at its overall business goal or strategic goal and identify how a transition to a green SC can help achieve those goals. Once the strategic intent to become green is set, a number of strategic initiatives are taken (sub-system 4). The GSC initiatives may be a number of tools, methods, techniques and practices that enable, encourage or force an organization, various segments and processes of the SC to increase their focus on sustainability. However, the initiatives may be confined by various dimensions that need to be analyzed (sub-system 5). The dimensions by linking with GSC focus areas like manufacturing, sourcing, human resource, infrastructure etc. (sub system 8) can be named as green sourcing, reverse logistics, green manufacturing, green distribution etc. Once the initiatives are confined by the dimensions, the required sustainability abilities, capabilities and adaptabilities of the SC can easily be identified

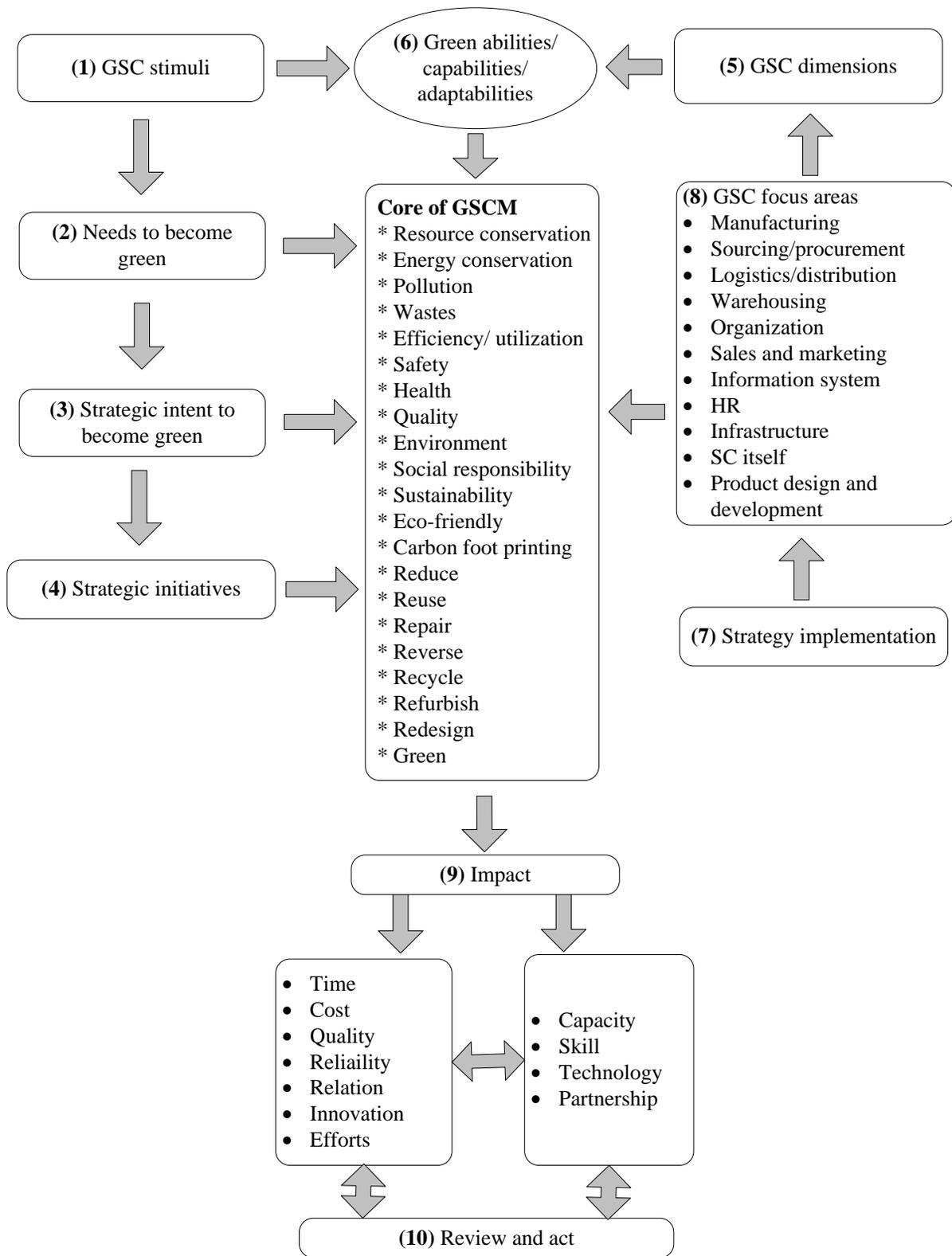


Figure 2 A conceptual model of GSCM

With respect to people, operations, processes, infrastructure of the SC (sub system 6). These abilities, capabilities and/or adaptabilities of sustainability refer to the potential or quality to be improved for achieving the desired green status in a chain by taking into account the various core factors of sustainability such as resource conservation, energy conservation, pollution, wastes, utilization, reuse, repair, recycle, health, environment, social responsibility etc.

In other words, every issue related to GSCM should address at least one core factor. These core factors address green thinking in the SC may largely focus on capacity, skill of the employees, technology and partnerships in various segments of the SC, impacting on one or more performance measures such as time, cost, quality, reliability, relationship, innovation and effort (sub-system 9). Therefore, there is a need to evolve a concrete road map for strategy implementation and execution (sub system 7). The exercise will lead to various types of impacts both desirable and undesirable. These impacts need to be measured and monitored in terms of various elements like capacity, skill, technology and partnership (sub system 9). At last, the system should be able to review its strategies, policies and actions plans (the sub system 10) to realize and achieve the desired state of GSC.

6.0 Conclusion

The trend towards developing a green SC is gaining popularity, though most organizations are still coming to terms how to achieve it, where do they start, who will be responsible for it and cost and benefit tradeoffs. This paper tried to demonstrate all the activities in GSCM and addressed why GSCM is essential to be implemented in all organizations. In this paper an attempt has been made to identify the three types of forces Viz. stimuli, enabler and inhibitor and examines the role of their dynamics in the SC. Our classifications and enlistments of the forces

will help academicians and practitioners to understand integrated GSCM from a wider perspective. We have also developed a conceptual framework to show how GSC is achieved through the various steps involved in it. The framework may provide a platform to companies to adapt and develop their own initiatives and practices from sustainability perspectives. In practice, companies can extend their manufacturing strategy process to incorporate environmental criteria for achieving GSCM.

SC with multiple players whether regionally and globally dispersed, green performance measurement is challenging due to the absence of proper evaluation techniques. Consequently, it is not possible to totally gauge the effect of GSCM on the competitiveness and the profitability of an organization. However, the work presented in this paper may act as the basis to develop future concepts and models that will facilitate managers and other stakeholders to integrate environmentally sound choices into SCM. To widely adopt the GSCM practices, explicit and stronger links among efforts of implementation, economic performance and competitiveness must be demonstrated that is the clear research need to be established.

References:

- Ashley, S. (1993) 'Designing for the environment', *Mechanical Engineering*, Vol. 115, No. 3, pp. 52-55.
- Bacallan, J. J. (2000) 'Greening the supply chain', *Business and Environment*, Vol.6, No. 5, pp 11-12.
- Beamon, B. M. (1999) 'Designing the green supply chain', *Logistics Information Management*, Vol. 12, No. 4, pp. 332-342.
- Bergstrom, R.Y. (1993) 'An annotated essay: environmental affairs', *Production*, Vol. 105, No. 4, pp. 36-41.

- Bloemhof-Ruwaard, J. M., Beck, P. V., Hordijk, L. and Wassenhove, L. N. (1995) 'Interactions between operational and environmental management', *European Journal of Operational Research*, Vol. 85, No. 2, pp. 229-243.
- Bowersox, D. J. and Closs, D. J. (1996) *Logistical management: The integrated supply chain process*, McGraw-Hill, New York.
- Carter, C. R. and ; Ellram, L. M. (1998) 'Reverse Logistics: A Review of the Literature and Framework for Future Investigation', *Journal of Business Logistics*, Vol. 19, No. 1, pp. 85-102.
- Chen, C. (2001) 'Design for the Environment: A quality-based model for green product development', *Management Science*, Vol. 47, No. 2, pp. 250-263.
- Fiksel, J. (1996) *Design for Environment: Creating Eco-Efficient Products and Processes*, McGraw-Hill, New York, NY.
- Fleischmann, M., Beullens, P., Bloemhof-Ruwaard, J. M. and Van Wassenhove, L. N. (2001) 'The impact of product recovery on logistics network design', *Production and Operations Management*, Vol. 10, No. 2, pp. 156-173.
- Florida, R. and Davison, D. (2001) 'Gaining from green management: environmental management systems inside and outside the factory', *California Management Review*, Vol. 43, No. 3, pp. 64-84.
- Godfrey, R. (1998) 'Ethical purchasing: developing the supply chain beyond the environment', *Greener Purchasing: Opportunities and Innovations*, edited by T. Russel, Sheffield, England: Greenleaf Publishing, pp. 244-251.

- Green, K., Morton, B. and New, S. (1996) 'Purchasing and environmental management: Interactions, policies and opportunities', *Business Strategy and the Environment*, Vol. 5, No. 5, pp. 188-197.
- Guide, V. D. R. and Wassehove, L. N. V. (2001) 'Managing product returns for remanufacturing', *Production and Operations Management*, Vol. 10, No. 2, pp. 142–155.
- Guide, V. D. R., Jayaraman, V. and Linton, J. D. (2003) 'Building contingency planning for closed-loop supply chains with product recovery', *Journal of Operations Management*, Vol. 21, No. 3, pp. 259-279.
- Guide, V. D. R. and Wassenhove, L. N. V. (2006a) 'Closed-loop supply chains: an introduction to the feature issue (Part 1)', *Production and Operations Management*, Vol. 15, No. 3, pp. 345-350.
- Guide, V. D. R. and Wassenhove, L. N. V. (2006b) 'Closed-loop supply chains: an introduction to the feature issue (Part 2)', *Production and Operations Management*, Vol. 15, No. 4, pp. 471-472.
- Henriques, I. and Sadorsky, P. (1996) 'The determinants of an environmentally responsive firm: an empirical approach', *Journal of Environmental Economics and Management*, Vol. 30, No. 3, pp. 381-95.
- Hervani, A. A. and Helms, M. M. (2005) 'Performance measurement for green supply chain management', *Benchmarking: An International Journal*, Vol. 12. No. 4, pp. 330-353.
- Hussain, M. (2011) 'Modelling the enablers and alternatives for sustainable supply chain management', A Thesis in the Department of Concordia Institute for Information Systems Engineering (CIISE)

- Jayaraman, V., Patterson, R. A. and Rolaand, E. (2003) 'The design of reverse distribution networks: models and solution procedures', *European Journal of Operational Research*, Vol. 150, No. 1, pp.128-149.
- Khiewnavawongsa, S. and Schmidt E. K. (2008) *Green power to the supply chain*, Purdue University, Indian.
- Letícia Labegalini, L., Gonçalves-Dias, S. L. F. and Csillag, J. M. (2010) 'Green supply chain management: the state-of-the-art literature review on production, logistics and operations international journals', *Proceeding, POMS 21st Annual Conference*, Vancouver, Canada.
- Maxie, E., (1994) 'Supplier performance and the environment', In: *Proceedings of the IEEE International Symposium on Electronics and the Environment*, San Francisco, CA.
- Min, H. and Galle, W. P. (2001) 'Green purchasing practices of US firms', *International Journal of Operations and Production Management*, Vol. 21, No. 9, pp 1222-1238.
- Narasimhan, R., and Carter, J. R. (1998) 'Environmental supply chain management', *The Center for Advanced Purchasing Studies*, Arizona State University, Tempe, AZ.
- Rao, P. (2002) 'Greening the supply chain: a new initiative in South East Asia', *International Journal of Operations and Production Management*, Vol. 22, No. 6, pp 632-655.
- Rao, P. (2004) 'Greening production: a South-East Asian experience', *International Journal of Operations & Production Management*, Vol. 24, No. 3, pp. 289-320.
- Rao, P. and Diane Holt, D. (2005) 'Do green supply chains lead to competitiveness and economic performance?', *International Journal of Operations & Production Management*, Vol. 25, No. 9, pp. 898-916.
- Sarkis, J. (2003), 'A strategic decision making framework for green supply chain management', *Journal of Cleaner Production*, Vol. 11, No. 4, pp. 397-409.

- Seuring, S. and Muller, M. (2008) 'From a literature review to a conceptual framework for sustainable supply chain management', *Journal Of Cleaner Production*, Vol. 16, No. 15, pp. 1699-1710.
- Sheu, J. B., Chou, Y. H. and Hu, C. C. (2005) 'An integrated logistics operational model for green-supply chain management', *Transportation Research Part E*, Vol. 41, pp. 287-313.
- Srivastava, S. K. (2007) 'Green supply-chain management: a state-of-the-art literature review', *International Journal of Management Reviews*, doi: 10.1111/j.1468-2370.2007.00202.x
- Van Hock, R. I. and Erasmus (2000) 'From reversed logistics to green supply chains', *Logistics Solutions*, Vol. 4, No. 3, pp. 28-33.
- Zhu, Q. and Geng, Y. (2001) 'Integrating environmental issues into supplier selection and management', *Greener Management International*, No. 35, pp. 27-39.
- Zhu, Q. and Sarkis, J. (2004) 'Relationships between operational practices and performance among early adopters of green supply chain management practices in Chinese manufacturing enterprises', *Journal of Operations Management*, Vol. 22, No. 3, pp. 265-289.
- Zhu, Q., Sarkis, J. and Geng, Y. (2005) 'Green supply chain management in China: pressures, practices and performance', *International Journal of Operations & Production Management*, Vol. 25, No. 5, pp. 449-468.
- Zhua, Q., Sarkis, J. and Lai, K. H. (2007) 'Initiatives and outcomes of green supply chain management implementation by Chinese manufacturers', *Journal of Environmental Management*, Vol. 85, No. 1, pp. 179-189.