A REVIEW OF GREEN SUPPLY CHAIN MANAGEMENT

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ABSTRACT

The main objective of this study is to review the recent literatures of the Green Supply Chain management (GSCM) and also determine the environment concern of this emerging field. The study is focused on development of GSCM which also includes that all the researchers from this review is focused on environmental and social sustainability towards operation management and the supply chain management. The important key that came out of this literature are green design, green management material, green marketing and distribution and reverse logistics. The purpose of this paper is to review the GSCM over the last fifteen years and guidelines to help academicians, researchers, and practitioners in better way to understand integrated GSCM from a wider perspective.

Key words: Green supply chain management (GSCM), environment, reverse logistics, green design.


1. INTRODUCTION
The rapid growth in industrialization has led the world into deterioration of environment in the past two decade. The pollution from the industry not only affects the human health but also being burden to global environment. Supply chain management has traditionally been viewed as a process wherein raw materials are converted into final products, then delivered to the end-consumer [1]. This process involves extraction and exploitation of the natural resources. Nowadays, most organization is starting to go green in their business as concern to environmental sustainability. They have realized the greater benefit of the green technology adoption in business operation, which also affected suppliers and customers [2]. Green supply chain management is the only solution to solve these three following problems namely supply chain management problem, environmental protection problem, resources optimization problem [7].

This paper will provide an overview of the Green Supply Chain Management (GSCM) literature. Knowing the wider perspective of the Green supply chain is an important step in knowing the branch of environmental sustainability. There are large amounts of literatures that surround GSCM, especially from 1989 to the present. But the key themes that came out of the GSCM literature over the last fifteen years are the concepts of green design,
Green operations, reverse logistics, waste management and green manufacturing [13]. The purpose of this paper, however, is to discuss some of these issues and provide an overview of the academician, researchers and practitioners better to understand from wider perspective of the GSCM literature.

2. GREEN SUPPLY CHAIN MANAGEMENT

Green supply chain management integrates the environmental thinking into supply chain management, including product design, material resourcing and selection, manufacturing process, delivery of final product to the consumer as well as end of life management of the product after its useful life. In order to achieve GSCM, the organization needs to follow the ISO 14001 basic principles [15]. The green supply chain management came up with systematic guidelines to implement effectively. They are Green Product Design, Green Material Management, Green Manufacturing Process, Green Distribution and Marketing.

2.1. Green Design/Product

To prevent it from pollution and conserve resources and energy, we should make full consideration of the impact on environment after the product is manufactured, sold, used and scrapped in the design stage, thus optimizing its process with good environment friendliness and global economy, rather than take preventive measures after the adverse effects on environment [17]. Some factors influencing green design such as

1. Design for environment
2. Eco design
3. Life cycle design

2.2. Green Material Management

The green material management involves purchasing of material or other products which are not harmful for environment. This material management includes many processes such as material selection, separation and material recovery.

Figure 1 Green Supply Chain
Material selection should be suitable for environment friendly and usage of different material is easy to separate.

More adaptable materials for multiple product applications should be used.

2.3. Green Manufacturing Processes

The green manufacturing process consumes excess of burning of natural resources like combustion of exhaust air, coal etc. which causes air pollution. Green supply chain not only requires the product with environmental protection, which shall not threat the health of the product user, but also requires the production process is harmless to workers with the minimal energy consumption and pollution.

2.4. Green Distribution and Marketing

Green distribution and marketing plays a major role in GSCM. The green marketing is a marketing which modifies the packages of the product and advertise the product in related environmental activities. Green Manufacturing emphasizes green characteristics during sale and promotion of products and services and highlight reduced environment cause. In particular, the factor of social responsibility plays an important role as mediator in the effect of green marketing on product or corporate reputation.

3. REVERSE LOGISTICS

Recycling, reuse, remanufacturing are considered to be reverse logistics function that also serve to GSCM. The Reuse which defined as to use an item more than once. Remanufacturing however refers to repairing, overhauling or refurbishing item in order to extend their life of the product [22]. Recycling process refers to processing or used material into new products to prevent the wastage of potentially useful materials.

4. LITERATURE REVIEW

Literature review in electronic media, journal publications, and books given a brief explanation on green supply chain management of Indian manufacturing industries such as According to B.L. Lakshmimeera and Dr. Palanisamy [18] concluded that the subject launches a number of challenges for managers, academics and researchers, GSCM involves a paradigm shift which the issue of sustainability is no longer seen as a source of cost, representing a potential source of competitive advantage for companies. Manufactures in India today are under pressure to adopt these strategies to create an environmental stance that is a driver for reduced costs and risks, increased revenues, and improved brand image. Organizations which have taken up the environmental position go beyond the basics of cutting waste and operating efficiently to adopt the strategy of lean and clean to be really green

According to Neemavat and Namdev has [20] discussed the cost and complexity are perceived as higher barrier to implement GSCM which highlight the need of cost effective and easy to implement solutions. Brand building is one of the top incentives for green supply chain management, highlighting the importance of public perception of how Indian companies operate the GSCM.

According to Kumar and Chandedkar studied the present system of functioning of Indian industries is deteriorating the environment and soon a day will come when damage done to earth will be irrecoverable [21]. Thus, it can be concluded that the GSCM is inevitable if the earth is to be keep green and appropriate methodology maybe adopted by industries to minimize the detrimental effect on environment.

4.1. Review of Previous Studies on Green Supply Chain Management

The summary of previous studies on GSCM are described below (table 1) on globally according to the manufacturing industry (Various industry)
## Table 1 Previous studies of GSCM according to manufacturing industry

<table>
<thead>
<tr>
<th>Year</th>
<th>Title/ author</th>
<th>Findings</th>
<th>Variables</th>
<th>Country</th>
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<tbody>
<tr>
<td>2011</td>
<td>Drivers of Green Supply Chain Management Performance: Evidence from Germany[1] Large, R.O. &amp; Thomsen, C.G.</td>
<td>The degree of green supplier assessment and Green collaboration has direct influence on Environmental Performance. These two practices are driven by the strategic level of the purchasing department and the level of environmental Commitment of the firm. 1)Commitment influences green assessment directly, the impact of commitment on green collaboration is Mediated by the capabilities of the Purchasing department. 2)Environmental performance has a positive impact on purchasing Performance.</td>
<td>Five potential drivers of green supply management Performance: Green supply Management capabilities. The strategic level of Purchasing department 1) The level of environment commitment 2)The degree of green supplier assessment 3)The degree of Green collaboration with suppliers Performance: Environmental performance and purchasing performance</td>
<td>Germany</td>
</tr>
<tr>
<td>2011</td>
<td>The Influence of Greening the Suppliers and Green Innovation on Environmental Performance and Competitive Advantage in Taiwan[3] Chiu, T.Y. et al</td>
<td>1)Greening the suppliers leads to green innovation and competitive Advantage. 2) The finding also support that the intervening variables of green innovation contribute to Competitive advantage. 3)Taiwanese companies have started to implement actions toward greening their suppliers and developing greener products and manufacturing process</td>
<td>1)Green innovation (Product innovation, Process innovation, Managerial Innovation) 2) Environmental Performance 3) Competitive advantage</td>
<td>Taiwan</td>
</tr>
<tr>
<td>Year</td>
<td>Research Title</td>
<td>Authors</td>
<td>Findings</td>
<td>Country</td>
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| 2011 | Research on the Performance Measurement of Green Supply Chain Management in China | Yan Li        | 1) Chinese enterprises have tried to implement a variety of GSCM practices to improve their environmental performance in response to the export philosophy.  
2) Internal environmental management, commitment from top level managers and support from mid-level managers will be necessary for development of any GSCM programs in China. | China   |
| 2011 | Is ISO 14001 a Gateway to more advanced voluntary Action? The case of green supply chain management | Arimura et al. | 1) ISO 14001 contributed to GSCM practices which facilities with ISO 14001 are 40% more likely to evaluate their suppliers’ environmental performance and 50% more likely to ask their suppliers undertake specific environmental practices.  
2) Government program of encouraging EMS adoption indirectly influences ISO 14001 adopters to implement GSCM practices. | Japan   |
<p>| 2011 | Evaluating Green Supply Chain Management among Chinese Manufacturers from the Ecological Modernization Perspective | Zhu et al.    | 1) The results highlighted the varying pace of Chinese manufacturers to ecological modernize with GSCM practices and the significance of regulatory pressure to diffuse the practices adoption by Chinese manufacturing industry. | China   |</p>
<table>
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<tr>
<th>Year</th>
<th>Title</th>
<th>Details</th>
<th>Country</th>
</tr>
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<tbody>
<tr>
<td>2011</td>
<td>The impact of green supply chain practices on company performance: the case of 3PLs [4]</td>
<td>Still limited adoption of GSCP among the 3PLs service providers, sometimes oriented only to a compliance with environmental regulations. Some participants have shown a pro-active attitude and gained significant benefit from the adoption of GSCP.</td>
<td>Italy</td>
</tr>
<tr>
<td>2010</td>
<td>Green Supply Chain Management in Leading Manufacturers: Case Studies in Japanese Large Companies [16]</td>
<td>1) Japanese large manufacturers implement one key GSCM practice, internal environmental management at a significantly higher level than Chinese manufacturers. 2) The four other GSCM practices were implemented at similar levels when compared to Chinese manufacturers. 3) It was found that large Japanese companies have made significant improvements for environmental and financial performance but not for operational performance.</td>
<td>Japan</td>
</tr>
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GSCM drivers (Normative pressure, Coercive pressure, Mimetic pressure)

GSCM practices (Internal & External dimensions)

GSCM performance (Economic, financial, operational)
<table>
<thead>
<tr>
<th>Year</th>
<th>Study Title</th>
<th>Authors</th>
<th>Key Findings</th>
<th>Geographic Location</th>
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<tbody>
<tr>
<td>2009</td>
<td>ISO 14001 in Environmental supply chain practices</td>
<td>Nawrocka et al.</td>
<td>1) ISO 14001 has a facilitating role in the environmental activities between a customer and a Supplier. 2) Closer relationship with suppliers was seen as beneficial both for the successful outcomes of projects and as a facilitator for environmental work. 3) The purchasing function, and its interplay with the environmental function and other company functions, was seen as important for engaging in supply chain activities.</td>
<td>Sweden</td>
</tr>
<tr>
<td>2009</td>
<td>An Empirical Study of Green Supply Chain Management Practices Amongst UK Manufacturers</td>
<td>Holt, D. &amp; Ghobadian, A.</td>
<td>1) Manufacturers identify the greatest pressure to increase environmental performance is legislation and internal drivers (IDs). 2) GSCM practices among the UK manufacturers are focusing on internal higher risk, descriptive activities. 3) Environmental attitude (EA) is a key predictor of GSCM activity and those organizations that have progressive attitude are also operationally very active.</td>
<td>UK</td>
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1) Communication of environmental requirements between a customer and a Supplier. 2) Motivation and enabling of a supplier company to comply with the requirements. 3) Mechanisms for control and follow-up.
<table>
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<th>Year</th>
<th>Title</th>
<th>Authors</th>
<th>Key Points</th>
<th>Location</th>
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</table>
| 2008 | A Review of Green Supply Chain Management                              |                              | 1) Buyer environmental requirements and support have positive effect to their suppliers’ willingness to participate in green Supply chain initiatives.  
2) The government can play an important role in Motivating these suppliers.  
3) The more slow resources and organizational capabilities suppliers had, the more willingly they were to participate in those Initiatives. | South Korea  |
| 2008 | Drivers for the participation of small and medium-sized suppliers in green supply chain initiatives [12] |                              |                                                                                                                                                                                                          |              |
| 2008 | Green Supply Chain Management Implications for “Closing the Loop” [16] | Zhu et al.                   | 1) Investment recovery seemed to get less Attention in China.  
2) However, more Chinese manufacturing have realized the importance of GSCM due to potential regulatory pressure in China as well as pending marketing pressure from Europe. | China         |
| 2008 | Influences, practices And opportunities for environmental supply chain management in Nova Scotia SMEs[11] | Raymond et al.               | 1) Small suppliers and medium-sized enterprises, have difficulties in allocating resources to initiatives that are not viewed as directly related to their core function, namely manufacturing the product or providing the Service.  
2) This study clearly demonstrated that opportunities exist to reduce greenhouse gas emissions and solid waste Within supply chains. | Canada        |
|      |                                                                       |                              | 1) Environmental Performance  
2) Environmental issues                                                                 |              |
Green Supply Chain Management in China: Pressures, Practices and Performance [14]
Zhu et al.

1) Chinese enterprises have increased their environmental awareness due to regulatory, competitive and marketing Pressures and drivers.  
2) However, this awareness has not been translated into strong GSCM practice adoption, let alone into improvements in some areas of performance, Where it was expected.

1) GSCM drivers(regulatory, supply chain partners, competitors, market)  
2) GSCM practices  
3) GSCM performance

China

5. CONCLUSION
The paper briefly provides an overview of the Green Supply chain literature. It argues that GSCM has helped to reduce the ecological impacts of industrial activity. The study also shows that diverse approaches of various authors towards the green supply chain management. The result of this study shows that implementation of green supply chain management for every industry is necessary.

REFERENCE


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A Review of Green Supply Chain Management


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