

## Propagation of Green Supply Chain Management: Hierarchy of Drivers

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### ABSTRACT

To embrace today's major global concern it should be endorsed for industrial organizations that environmental sustainability is not an option but a mandate. Frequent occurrences of hurricanes, floods, droughts, ecosystem changes, depletion of the ozone layer and other tribulations with intense level have strongly attracted the world's attention. Since the Industrial Revolution in the early 19th century until today, the world temperature has gone up by 2°Celsius. If enough measures including steps to reduce carbon emission are not taken with immediate effect, the unhindered global warming is destined to cause serious damage to the climate in which human life will be in total danger. To respond to this environmental issue, the concept of green supply chain management (GSCM) has to be propagated in industrial practices by integrating the drivers to boost the process of environmental awareness, understanding and thinking. A lot of research efforts have been made to identify the drivers for implementation of the GSCM in industrial settings. In this paper, an attempt is initiated to review the relevant recent articles and to explore the significant drivers of GSCM with a ranking. The main drivers as derived from this study are listed as government regulations, customers, certification, competitiveness, eco-design, top management and green supplier. The findings will be helpful to spot the future efforts of research in green supply chain management and to take strategic decisions for effective implementation of GSCM.

**KEYWORDS:** Drivers, Green Supply Chain Management, Sustainability.

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### INTRODUCTION

Rapid growth of high technology has significantly influenced the living standards of human race. More energy consumed and more resources are needed to cater the needs. However, the greater rate of resource consumption has led to the deterioration of the environment which could risk the human life and sustainable development. This current "living standards" is only based on the economic worldview while neglecting the environment perspective. In particular, the risk of global climate change, soil exhaustion and the extinction of plants and animals species are worsening. Efforts to prevent the environment from damages has been widely discussed from both developed and developing nations. Accordingly, there are a lot of efforts that the researchers and practitioners have done in order to solve the environmental problems and one of them is the emergence of the green supply chain management (GSCM) concept. Basically, GSCM is the integration of the management of supply chain and the management of the environment. One of the attempt to sustain the environment is by reducing the carbon emission along the supply chain. It is because the increase of carbon dioxide gas (CO<sub>2</sub>) in atmosphere will cause the risk of global warming to occur. In this review, carbon emission scope is considered as the emission of CO<sub>2</sub> gas which is caused solely by human activities or so called anthropogenic emissions.

Since GSCM is a complex and dynamic process, several studies to identify their driving factors has been explored. Since year 1998, various literatures have examined the drivers and barriers affecting the GSCM. However, a recent literature review for the green supply chain drivers done by [1] covers researches carried out on green drivers until year 2011. Later, various drivers were being explored within several scope of the green supply chain. Some studies are focusing on external drivers like government policies, financial, social, stakeholders and public pressures and supply chain integration while others are concentrating on internal drivers like the eco-design, green purchasing, remanufacturing and recycling, etc. As a result, the drivers identified by the researchers are diverse from the perspective of theoretical approach and practical implementation. This paper explores the significant drivers of GSCM suggested in the published articles and categorizes those into two main groups in the form of the external and internal drivers. Thus this study on identification of the GSCM drivers is deemed to play an important role as guidelines for decision makers, though there is not enough investigation about the overall impact on the desired outcomes.

## CLASSIFYING DRIVERS AS EXTERNAL AND INTERNAL

The propagation of the GSCM have emerged from both external and internal motivation. Hence, this paper explored the result of the significant drivers drawn by previous findings which grouped into two main part as the external drivers and the internal drivers as shown in Figure 1.

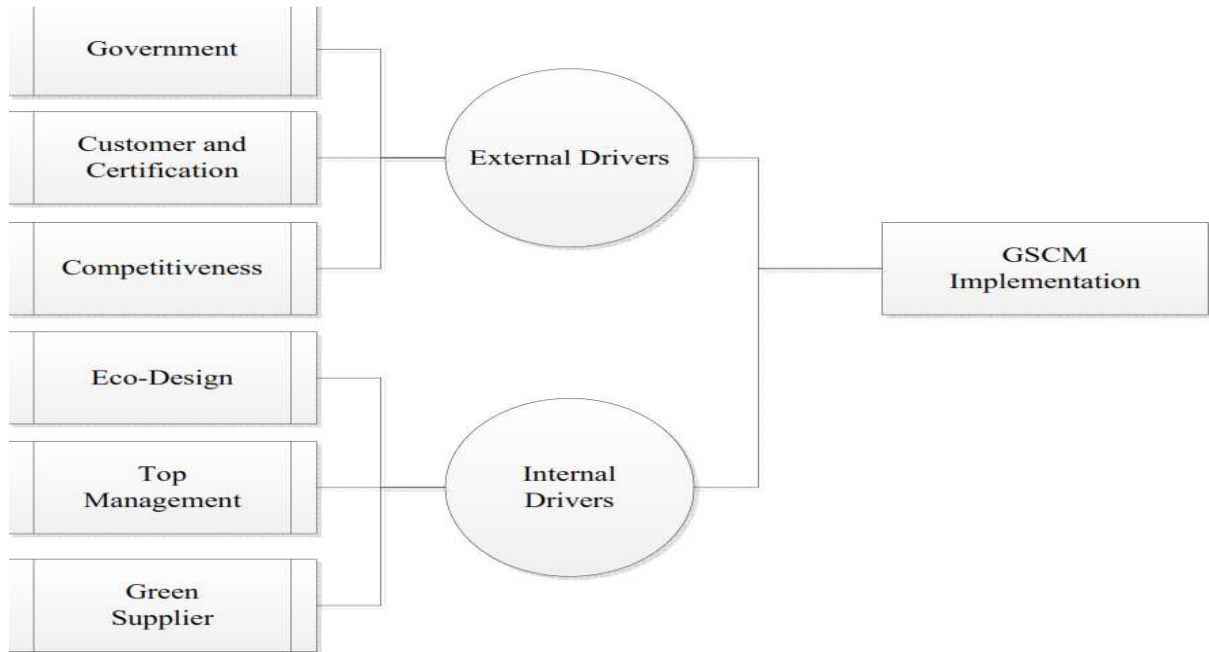


Figure 1: Main drivers for GSCM implementation

### EXTERNAL DRIVERS

Although the environmental awareness within society has increased [2], many firms are still not implementing green in their operations. The pressure from the outside of the organizations appears to have higher impact for them to go green. Government, customer and certification are the external drivers that has been identified to be significant stimulus for the implementation of GSCM.

#### Government Regulations

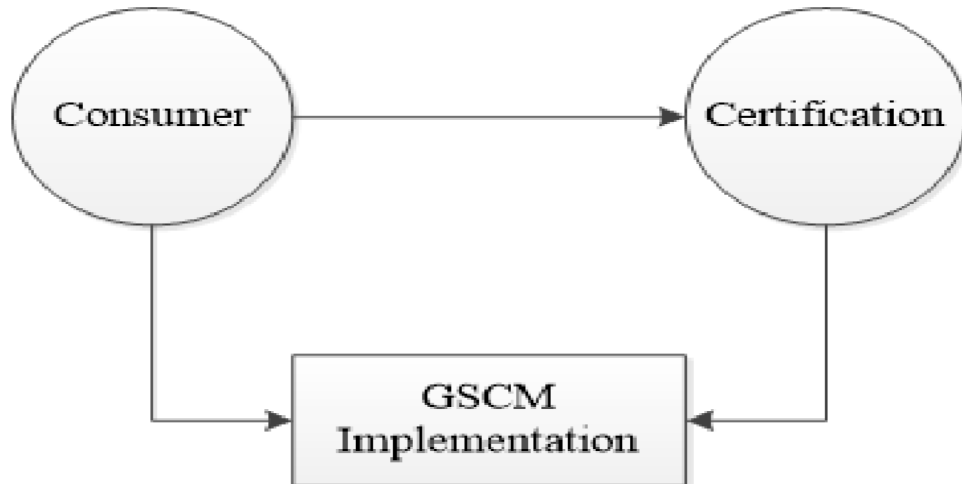
Studies on the drivers that could motivate the environmental sustainability to be achieve is never an exhaustive efforts. Eventhough government is the company's stakeholder, most researches develop a distinct factor when analyzing the GSCM drivers. In [1] has reported that government regulations is the top key element among other fourteen drivers that could be the key to the GSCM implementation. This finding is supported by a study on the antecedent of GSCM by [3]. They identified that green design, process and components are greatly driven by government regulation and industry standards like ISO 14001. Next, in [4] proved that government is the most dominant driver for GSCM in their structural model using Interpretive Structural Modelling (ISM). Furthermore, in [5] also highlighted that the government support and policy is the most important factors when adopting sustainable consumption and production. In addition, in [6] claims that the link between the government and the supplier's consumer is highly related. Between buyers and government, the influence on the supplier's signify differently. In a research using Interpretive Structural Modelling (ISM), government regulation and reverse logistics are found to be the biggest drivers towards the cooperation between the suppliers and the product designers [7]. In extension to that, government regulations is also found to be the biggest influence to push the firms towards applying green supply chain [1]. In [8] has observed that regulation compliance have the biggest influence for the green manufacturing to be employed. It seems that the firms have no option other than to adopt the green manufacturing so that they comply with the regulations. Additionally, recent empirical research has proved that the government regulations is the most important factor in promoting green practices assessed by critical success factor method [5]. This is because they emphasis on the power of authority. Firms have no option, but to comply with the regulations. From these findings, we can conclude that the policy by the government is the top priority to drive GSCM. Government regulations employ directive and rules, which can act as a control mechanism in today's materialistic world which focus only

on the economic aspects. Thus, we suggest that government policy are able to protect the environments rights. It is to ensure the sustainable initiatives like the reduction of energy consumption and increase in the production efficiency is successfully implemented. In order to achieve environmental sustainability, efforts that has been establish by the government need to be further identified.

In conjunction with this finding, we will explore on the efforts that has been carried out by the government regulations. There are a wide range of initiatives done by the government in order to sustain the environment. According to [9], lack of sufficient policy is the cause of why suppliers failed to implement green practices. They are unaware of the importance of the carbon emissions reduction activities. Perhaps they have been preoccupied with the cost objectives more than the environment objectives. Considerable efforts need to be implemented to achieve the UN Framework Convention on Climate Change (UNFCCC) target. Some developed countries introduced carbon tax and tariff policy, while other developing countries are going towards command- and-control policies. Other than employing policy, some government also giving incentives to boost the firm's motivations to support greener technology and use cleaner process in their supply chain [10]. In [10] also identified that carbon tax implementation will cause the reduction in the environment pollutions. In addition, in [11] summarized efforts done in Europe from four case studies. Macro-scale regulation, altering market structure, incentives to both research innovation and practical innovation. China's government imposed tax while South Korea's governments regulate new policy to force the acceleration of the GSCM practices in their countries. In year 2009, Malaysian government has establish National Green Technology Policy, comprises of green technology research, promotion and public awareness. Besides regulating green policies, government also play important roles in educating the people on the importance of going green. One of Malaysian government efforts is by providing incentives to help the suppliers to adopt energy efficiency, which indirectly improved the environment sustainability. Later on, feed-in-tariff (FiT) mechanism has been introduced in 2011. It is an investment by providing incentives to boost the renewable energy initiatives. Recently the government announced the Eleventh Malaysia Plan (2016-2020) which embarked on green growth by implementing the green building, adopting sustainable consumption and production, green transport and incentives for producers and users of green technology [12]. In addition, Enhanced Time of Use (ETOU) tariff scheme was introduced as a self-regulation tool to manage electric consumption for people. The electric is charged varies at different time zone which are peak, Mid-Peak and Off-Peak. In spite of these initiatives, yet no studies have done to see the impact of them. On one hand, in [13] argue that government also should regulate automotive industries to adopt green innovation. All the initiatives done by the government are essential in order to achieve environment sustainability. As [14] stated that government play a vital part to go green. In [15] believed it is critical that the firm's awareness and good knowledge on energy-efficiency as the key element that will aid the government's green effort. Thus, besides policy, more knowledge and information, awareness, subsidy and incentives by the government will motivate the green technology to evolve and effectively reduce the carbon emission. Nevertheless, policies by the government only is not enough to force the firms to implement green practices [16].

### **Consumer, Certification and Competitiveness**

Besides government and stakeholders, the other driver that has been identified as having the second major influence towards the green supply chain implementation are consumer and certification. When it comes to the GSCM driving force, most stakeholders are more attracted to the reputation rather than efficiency and innovation [17]. This competitiveness on "reputation-led" has a very good ripples effects when it also draws the attention of their competitor to also implement green practices. In [18] has reported that customer which is also the stakeholder as the top reason for the GSCM implementation, compared to other reasons such as competition and government regulations. In [19] conversely studied on the influence of the customer pressure on GSCM practices and environmental and financial performance in manufacturing. They concluded that in order to respond to the customer pressure, collaboration between firms and supplier is highly important. Indirectly, GSCM implementation is driven by consumer. This is because consumer has an effect on the certification. This collaboration is develop by the certification Figure 2 shows the influence of the consumer towards the green certification adoption.



**Figure 2: The influence of consumer towards certification and GSCM implementation**

Next, in [20] used fuzzy Decision Making Trial and Evaluation Laboratory (DEMATEL) method proved that ISO 14001 certification belongs to the cause group that influence the green system implementation. International Organization for Standardization (ISO) 14001 is the standard used to inform the stakeholder about the Environmental Management System (EMS). Mostly, firms are adopting ISO 14001 because, this certification will help them improve their brand image. By improving the brand image, the firms will be able to encourage buyers from different countries. Green consumer normally will request the suppliers to provide the product information [21]. Asian countries like Thailand, Japan and Korea have already implemented product labelling. Certification is importance for the customer's recognition. Another advantage of ISO14001 certification is in terms of social awareness towards the employees in the firms. In [22] applied ISM approach to analyse the synergy between eleven GSCM drivers, identified 'legislative and regulatory compliance' as the most importance drivers whereas ISO 14001 certification positioned as the second most importance. Besides, in [21] also stated that firms also implemented various environment standards like ISO 14064-Parts I and II and PAS 2050. Those standards are for carbon inventory management. They also argued that it is very importance to launch the education and training to raise awareness on environment standards for every employees. By executing ISO14001, the employees will have the opportunity to understand green management much better [23]. In [24] concludes that the most significant pressures for GSCM is the pressures from the consumers. Another outcome from [25] is that they found that the closer the location of the chain to the consumer, the higher the influence that the firms get to implement GSCM. They stresses that the effect from the consumer can be short-term, however there is a growth in society awareness and responsiveness towards environmental sustainability.

### INTERNAL DRIVERS

Separately, studies on the internal drivers towards GSCM also been done by many researchers. In [26] measured the impact of twelve drivers that influence the overall performance of the green manufacturing in the organisations. They found that the stakeholder enrichment, green disposal initiatives, process management initiatives, top management commitment and suppliers management are among the key drivers that will lead to positive impact of the organisation's performance. Moreover, in [27] recognized top management and competitiveness as the two most important drivers for the GSCM adoption. Besides regulations and customer pressure, in [8] asserts that the commitment from the top management is the key towards the successful GSCM. Their study also indicates that financial benefit is the one that mostly will draw the firm's interest to implement green manufacturing. Thus, more research that demonstrate the financial advantage of going green need to be done. Unlike [5], they analyse different drivers that affects different green practices. They suggested that regulation have important impact on green manufacturing while, internal management, customer management and supplier management have the significant impact on green design. Whereas, both regulation and internal management are responsible for the green production. On the other hand, in [25] evaluated the efforts of the supply chain management with the pressures from various stakeholders. They deduced that stakeholder is the key for the supply chain implementation.

Besides, eco-design, green production, green purchasing, green recycling, green transportation and green warehousing were identified as the important criteria that firms need to establish in order to achieve environmental sustainability. In addition, a study using fuzzy set theory VIKOR done by [28] established that

eco-design as the top cause for GSCM. However, how the ranking procedure has been done is not clearly been described. Generally, collaboration between the firms with the suppliers and consumers will lead to the successful GSCM practices [14]. Table 1 summarizes the main drivers extracted from previous researches. Symbol 'X' refers to the number of occurrence for each driver that has been studied by an author. More than one 'X' means that, the author has mentioned the same driver from different perspective. The table is arranged in a sequence of most significant to the least significant drivers, from left to right. No weightage is assigned in this table. According to opinions of different authors based on their surveys, seven out of ten authors suggested that government regulations is the most significant drivers, followed by the stakeholder, consumer, certification, competitiveness, eco-design, top-management and green supplier.

## CONCLUSION

This paper has reviewed previous studies on the GSCM drivers since 2010. With the identification of these main drivers, this paper will help the decision-makers to understand better the factors of going green. Some drivers can be individually implemented, while the others need mutual and co-existent to be implemented. From previous research output, we can conclude that the government needs to regulate a policy or regulations to force the implementation of green supply chain to be successfully meets the sustainability objectives. However, most of the researches who identify these drivers were only done at the small and medium-sized companies due to the research limitations on the sampling size of the population. The reason is that the larger the enterprise population, will need a much larger sampling data, which is normally a limitation in a research. Like other study, this paper have some limitation. There is no weightage has been calculated in order to rank the drivers. Impact for each drivers also is not been discussed. In the future, study to analyze the impact of the government efforts, consumer, certification and other internal drivers on the GSCM can be considered.

Eventhough the most significant drivers have been identified, what is the most important question arise is: Why did GSCM is still not being implemented by the firms? More research need to address to this question thoroughly. In extension to this review, for future direction we suggest that in order to draw interest from the companies to adopt GSCM, more studies on the financial benefit need to be done. A study on sector wise with the holistic view on the potential reward, will attract more companies to come forward and adopt the environmental policy and could even go beyond the environmental compliance voluntarily. With green to gold concept, more stakeholders will embark the environmental thinking into their business strategy.

Furthermore, the perspective and the behaviour of accepting and believing value of the green supply chain need to be addressed. The study on the whole significant drivers towards the environmental performance also need to be done so that the direct effect of these drivers can be recognized. Certainly, the successful GSCM implementation will cause the reduction of the carbon emission and the risk of climate change will be lessen.

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