

FACTORS OF IMPLEMENTING THE GREEN SUPPLY CHAIN MANAGEMENT IN THE MALAYSIAN CONSTRUCTION INDUSTRY

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ABSTRACT

Recently the issue of Green Supply Chain Management (GSCM) has received attention, calling the construction industry to change its practices and adopt this sustainable approach to minimizing an organization's total environmental impact. However, perusal the literature review it provides a broad explanation of the GSCM framework but identifying the berries of why the approach is not yet implemented, the benefits of why it should be implemented and to what extend is the GSCM is involved in the Malaysian construction industry. Hence, by questioning 30 of the construction role players from various backgrounds in the industry about the benefits, barriers and the involvement if the model in the Malaysian construction industry, the finding were the majority of the respondent agreed that GSCM would have a great impact to the industry and they managed to identify the barriers and it exposed how much the approach is not involved in the industry

Keywords: *GSCM, Malaysian construction industry, Environmental management, Waste management.*

INTRODUCTION

Climate change has been marked worldwide as the current imminent danger for the planet, rising greenhouse gas (GHG) emission causing the named event with a 30-40% contribution from the construction section according to the environmental program by the United Nations in 2017 (Silva, 2019). With all those alerts from the planet, green supply chain management (GSCM) becomes a top priority for the governmental and the private sectors to be implemented and forced for good in the construction sector and any other industry that plays a part in the industry (Kumar, 2019).

Green supply chain management is a triple bottom line framework for any industry or sector that positively affects the profit, people, and the planet as it helps enhance the project life cycle of any project by reducing the number of stakeholders involved in the project. They made it less fragmented, hence reducing the project duration and the total project cost while creating satisfied customers and creating a centre of attraction for several people around the world who are calling for more sustainable use of the world resources. The construction sector covers a range of issues and uses vast amounts of resources, which cause damage to the environment. Wastes applies to all phases in the construction lifecycle (Cervera, 2012).

The construction sector must adopt environmentally sound planning and design practices to create a safe and sustainable environment design or construction waste materials resulting from

development, reconstruction, destruction involving excavation, civil and building construction, road work, clearing of sites, demolition, and renovation of buildings (Gandhi, 2015).

DIFFERENCE BETWEEN TRADITIONAL SCM AND GSCM

The SCM platform was first introduced and implemented in the industry in the 1970s, which is the management of products from raw material and outsourcing going through the product life-cycle to the operational life-cycle (Mackall, 2006).

Fast-forward, with the beginning of a new decade of the '20s, a new threat was hitting the globe, which is climate change. Therefore, the scientist started to call for a change of any traditional platform to be sustainable and eco-friendly to enhance its harmful effect. From here, the GSCM is introduced to the market. The new platform improves the SCM's performance by integrating sustainable practices with SCM and pushing it forward to be green supply chain management (Srivastava, 2007). This platform is the interdependence between the product life-cycle, operational life-cycle, and waste management, where we can find the critical elements of reducing, re-use, recycle, re-manufacture, and disposal. Those key elements to be adopted in each phase of the project (Jaggernath, 2015). Integration of Green innovation has become an essential component of the organizations, and GSCM has become a major critical strategic driving force for organizations by including smart manufacturing, green procurement, green management, green merchandising, transportation, and reverse logistics.

GSCM CYCLE IN THE CONSTRUCTION INDUSTRY

Green Initiation

Green initiation has been recognized as a crucial necessity to decide where developers in their projects need to design and create sustainable projects that can offer lower emissions, water savings, and a healthy environment (Ali, 2016).

Green Design

The project design phase is of utmost importance for the industry, as decisions are taken directly affecting the environmental effects of construction's life cycle (Zhang, 2011). The phase shall begin with an assessment to measure the impact of design on the environment to evaluate potential effects on the building's surrounding flora and fauna.

The design team also must take climate conditions into account, form, and structure of the building and its thermal properties. The provision of natural ventilation and lighting, for example, will minimize energy consumption. Likewise, incorporating the right technical systems in the design of buildings, such as solar panels, energy-efficient heating, lighting, air conditioning systems, and wastewater recycling technologies, is essential for improving the building's environmental performance (Ng, 2012).

Green Procurement

Companies' concept of green procurement could be categorized into broad and narrow meanings based on the application and conceptual viewpoints. Reducing, reusing, recycling is the symbolic practices of businesses making efforts to reduce environmental impacts (Hassan, 2016). Examples of the procurement process's execution according to the 3Rs are the prevention of hazardous substances in goods, careful management of hazardous waste, the exhaust pollution regulations, and green procurement to fulfil the criteria for using recycled materials (Chun, 2015).

Green Construction

Green construction is a practice that seeks to optimize the utilization of raw materials and reduce construction practices that may harm the environment while controlling the energy consumption, earth utilization, water usage, and material wastage in addition to not jeopardizing the future generations fair share of earth's resources and protecting the environment (Chun, 2015).

Green Logistics

Reverse logistics involves the initiation, implementation, and management of construction artifacts and raw materials. This includes the flow of knowledge for efficient management of building disposal in the project's life-cycle and compliance with the necessary technical and legal requirements that the current government's way of drawing up green logistics plans to prevent resource waste (Dowlatshahi, 2000).

ADVANTAGES OF ADOPTING THE GSCM IN THE CONSTRUCTION SECTOR

Several experts made it very clear in their work that the application of GSCM is very critical and result-oriented, which considers the organization's environmental aspects (Gandhi, 2015). The advantages of GSCM will be described below in the following subheadings.

Financially

GSCM's most crucial advantage is the long-term cumulative change in its financial results (Emmett, &. 2010). It was also said that companies tend to adopt GSCM to implement their comparative advantages and accomplish increased profit percentages (Gandhi, 2015). Implementing the GSCM generates many industrial benefits that can be described as optimizing environmental efficiency, minimizing, causing waste, and reducing costs, leading to higher profit and market value (Cervera, 2012).

Resources Sustainability

GSCM promotes the best use of all accessible organization's efficient tools. By integrating GSCM thinking into their entire business decision-making process, companies can now use renewable input tools to achieve the desired renewable outputs in an environmentally sustainable manufacturing process (Kumar, 2019). GSCM was also related to managing human resources to attain sustainable growth and genuinely sustainable supply chains (Diabat, 2011). This is known as an integral part of establishing consumer sustainability (Sarkis, 2003)

Competitive Advantage

It allows a company to put itself in the consumers' minds and their goods as environmentally friendly. In addition to attracting potential profitable consumers for companies, it would have a more competitive advantage in the global market. It would also enhance brand identity and business credibility. Efficient GSCM implementation in any company plays a crucial role in creating and managing competitive benefits (Zhu, 2004).

Adaptation to Laws and Risk Management

Organizations that implement GSCM policies will reduce the litigation for anti-environmental activities. A demonstrated effort to establish an efficient GSCM through the ongoing commitment

of resources, operation, calculation, and management procedure will be highly regarded if any problem arises (Diabat, 2011).

Environmental

GSCM raises different buyers' incentives by growing its emphasis on improving the environment, enhancing the environmental, greening cycle, and expanding the supply chain's economic and environmental efficiency.

This includes reducing air pollution, reducing wastage of water, and reducing solid waste. Diminishing toxic waste, reducing environmental degradation, and enhancing an organization's ecological condition (Wu, 2012).

BARRIERS IN IMPLEMENTING GSCM

External Barriers

A study found that the most common external pressures are legal demands, consumer demands, and stakeholder responses. So, there are two kinds of barriers. External barriers include costs and the lack of legislation, whereas external barriers are restrictions, low supplier participation, and barriers unique to the industry (Mathiyazhagan, 2013). Those are challenges beyond the locus of influence for the company. The Barriers Identified by the building industry adverse to green practice implementation includes:

- Green Professionals Shortage.
- Shortage of green suppliers.
- Inflexible deadlines for the stakeholders.
- A lack of co-operation from stakeholders.

Internal Barriers

Higher costs, planning difficulty, scheduling effort, and inadequate or incomplete contact in the supply chain are internal obstacles to effective supply chain management, while significant internal supportive drivers intersect communications, management structure, control, assessment, sanctions, and reporting (Diabat, 2011). A group of 4188 managers was surveyed in seven countries, Although the findings have been promising from improving an organization's credibility and brand. They were using the ISM interpretive through an Indian case study. To implement GSCM activities, they examined eleven drivers. The top drivers mentioned in the research were Green design, integrated quality management of the environment into the planning and operation process, reduced energy consumption, reuse and recycling of products, and packing drivers (Holt & Ghobadian, 2009). To summarise, GSCM implementation hurdles are as follows:

- Lack of understanding from the public.
- Insufficient commitment from top executives.
- Recyclable goods lack demand.
- Lack of resources.
- Lack of environmental impact awareness.

- Lack of exchange of communication between the construction companies and suppliers.
- Lack of government Rules neglects legal compliance.
- Lack of demand.
- Lack of sustainable practices in the vision and mission of the organization.

RESEARCH METHODOLOGY

The excellent study utilizes appropriate and accurate tools, instruments, and techniques for data collection. For the study to be carried out, data collected through a questionnaire to assess the hypotheses and the objectives to identify the barriers and it exposed how much the approach is not involved in the industry. Several different processes, procedures, techniques, and technologies have been created to help collect data. These methods develop various ways to identify and measure the data. The approach was chosen also affects the available techniques and instruments.

Study Population

In this study, the population consists of:

- Project managers
- Construction managers
- QA and QS engineers
- Project engineers

In the Malaysian construction industry. So, we are targeting at least 15 respondents, the first 7 respondents were given the pilot survey which consist of 48 questions and we had their feedback about the questionnaire to identify the most efficient questions therefore they chose 27 questions which were eventually given out to the rest of the respondents.

A research sample means testing a sub-set of a target population. The study employed the findings obtained from the survey to generalize the entire population. E.g., the sort of generalization will be that the sample is genuinely representative of the whole population.

Data Analysis

This sub-section deals with how the information obtained has been converted to meet the criteria for answering the research questions outlined in the report. For the study of the quantitative data obtained, statistical software called SPSS (Statistical Kit Software for Social Sciences) was used. The data were coded and analyzed using the statistical package, using both descriptive and inferential statistics, reliability and KMO test were used to prove the instrument's validity.

RESULTS

The willingness to adopt the GSCM

As shown in Table 7.1, 47% of respondents indicated their willingness to include GSCM practice in their plan, while 53% stated that it might be included.

Table 7.1: Does your company planning to include GSCM?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	14	46.7	46.7	46.7
	Maybe	16	53.3	53.3	100.0
	Total	30	100.0	100.0	

Benefits of GSCM

Figure 7.1 below shows that a majority of the respondents indicated improved sustainability of resources, firm adherence to regulations, reduction in risks, and improved quality of products as significant effects, while positive impact on financial performance, increased efficiency, improved product differentiation, and enhanced product competition were indicated as having a moderate impact.

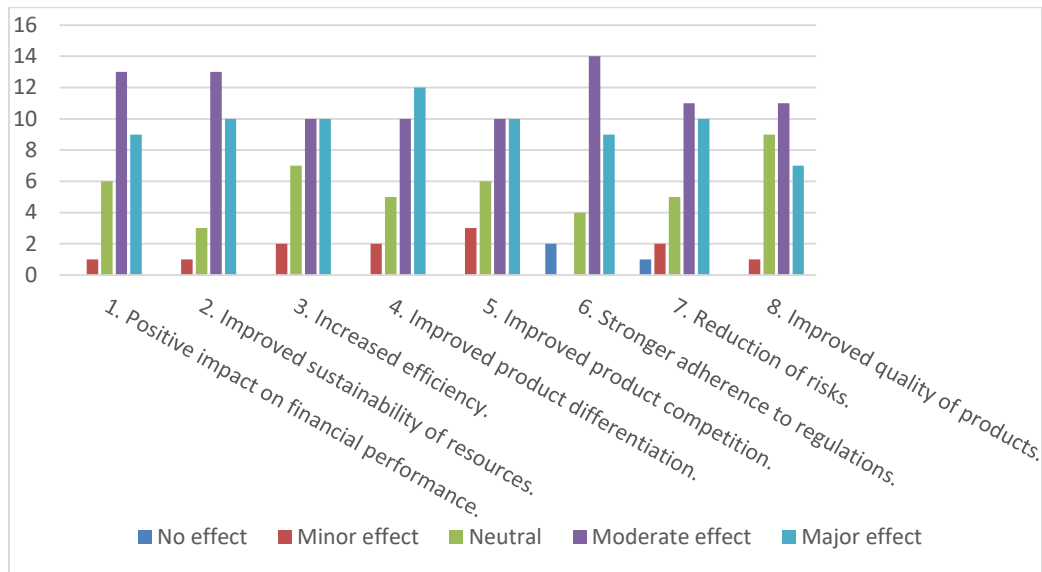


Figure 7.1: Benefits of GSCM

Barriers in GSCM implementation

Figure 7.2 below shows the findings on barriers to GSCM implementation from this research. A majority of the respondents pointed out the extreme obstacles: lack of resources, lack of knowledge about environmental impacts, lack of legal enforcement by the government, and lack of public awareness. Simultaneously, the lack of markets for recyclable materials and insufficient top management commitment were indicated as somewhat barriers by most respondents. Moderate barriers are lack of demand, lack of sustainable practices in the organizations’ vision and mission, lack of information sharing between construction firms and suppliers.

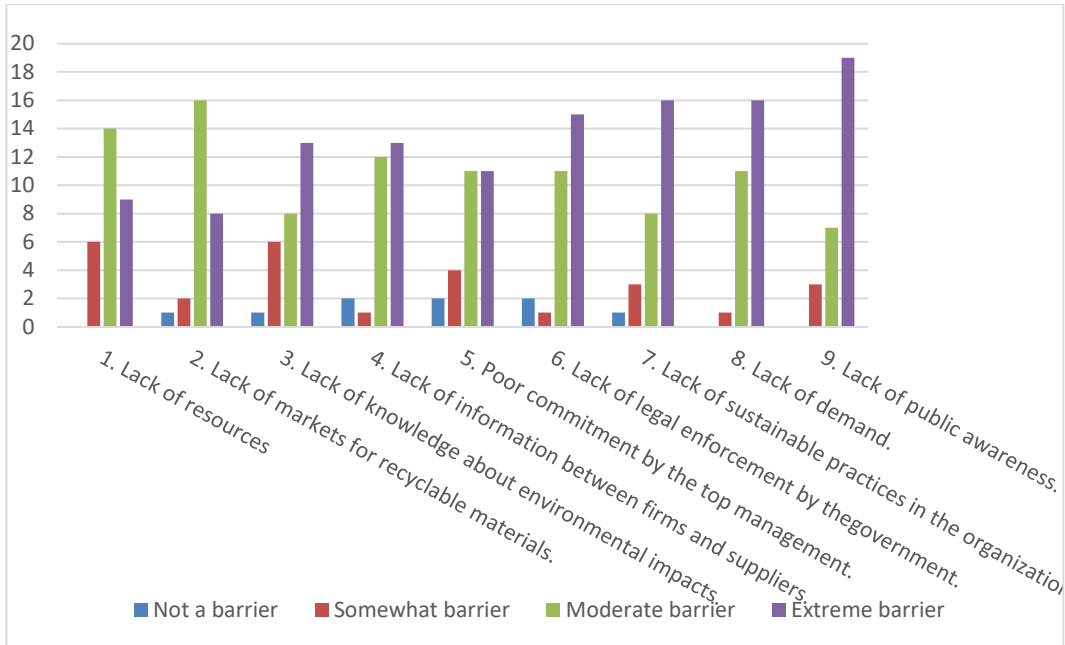


Figure 7.2: Benefits of GSCM

Testing of the Hypotheses

At the beginning of this study, three (3) hypotheses were formulated. These form the basis for the questionnaire. The responses to the questions related to this hypothesis were tested to know how valid they were by using the KMO and Bartlett’s test, a statistical technique. The researcher chose a level of significance of 0.05 or 5%; i.e., the researcher agreed to make an error of five (5) out of a hundred estimate, and as shown in table 7.2, 7.3 and 7.4 the significant differences are 0.001, 0.00 and 0.001 which are all less than 0.005.

Table 7.2 KMO test for implementation of GSCM in Malaysia

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.500
Bartlett's Test of Sphericity	Approx. Chi-Square	39.465
	df	1
	Sig.	.000

Table 7.3: KMO test for benefit of GSCM

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.500
Bartlett's Test of Sphericity	Approx. Chi-Square	39.465
	df	1
	Sig.	.000

Table 7.4: KMO test for barriers of GSCM

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.500
Bartlett's Test of Sphericity	Approx. Chi-Square	39.465
	df	1
	Sig.	.000

Test of Hypothesis One

Ho1: GSCM is new to the Malaysian industry

To assess if GSCM is unique to Malaysia's building industry, the respondents were asked whether their firms practiced GSCM. The findings were tabulated and presented in Table 4.5. The majority (60%) of respondents said they did not follow GSCM. The Chi test was done and revealed no significant difference in responses ($p > 0.05$). This outcome means that in Malaysia, GSCM is relatively recent. Hypothesis H01 thus is accepted. This means that GSCM is a new concept; in other words, Malaysian construction companies already have a basic idea and knowledge of Green Supply Chain Management.

Test of Hypothesis Two

Ho2: There are barriers in the building sector that can affect the implementation of GSCM. To measure the degree to which barriers influence the performance of GSCM in the Malaysian construction industry, respondents were asked to show to what extent each aspect is a barrier to GSCM implementation (see Section E of Appendix 1). Using The Chi test, the rating was checked, and the findings were presented in Table 7.5.

The findings reveal that nine elements are substantially different ($p < 0.05$). Then the second hypothesis stated above was accepted.

Table 7.5: The mean answer of section E

		Statistics				
		1. Lack of resources	2. Lack of markets for recyclable materials.	3. Lack of knowledge about environmental impacts.	4. Lack of information sharing between construction firms and suppliers.	5. Poor commitment by the top management.
N	Valid	30	29	29	29	30
	Missing	0	1	1	1	0
Mean		3.10	3.21	3.21	3.28	3.13

		6. Lack of legal enforcement by the government.	7. Lack of sustainable practices in the organization's vision and mission.	8. Lack of demand.	9. Lack of public awareness.
N	Valid	30	30	30	30
	Missing	0	0	0	0
Mean		3.37	3.30	3.57	3.57

Test of Hypothesis Three

Ho3: GSCM has perceived a positive impact of the construction industry on environmental indices.

To test whether GSCM has a positive impact on environmental indicators by the construction industry in Malaysia, the respondents were asked to indicate the effect the construction managers think GSCM implementation will have on each environment indicator.

Using The Chi test, the rating was checked, and the findings were presented in Table 7.6. The results reveal that the nine elements are substantially different ($p < 0.05$). Then the second hypothesis stated above was accepted.

Table 7.6 The mean answer of section F

		Statistics			
		1. Positive impact on financial performance.	2. Improved sustainability of resources.	3. Increased efficiency.	4. Improved product differentiation.
N	Valid	30	30	30	30
	Missing	0	0	0	0
Mean		4.07	4.13	4.00	4.13
Sum		122	124	120	124
Percentiles	25	3.75	4.00	3.00	3.75
	50	4.00	4.00	4.00	4.00
	75	5.00	5.00	5.00	5.00

		Statistics			
		5. Improved product competition.	6. Stronger adherence to regulations.	7. Reduction of risks.	8. Improved quality of products.
N	Valid	30	30	30	30
	Missing	0	0	0	0
Mean		3.93	3.97	3.93	3.73
Sum		118	119	118	112
Percentiles	25	3.00	4.00	3.00	3.00
	50	4.00	4.00	4.00	4.00
	75	5.00	5.00	5.00	4.25

CONCLUSION

GSCM is not fully adopted in the Malaysian construction industry, according to the majority (60%) of the respondents from the survey. They indicated that they do not practice GSCM. From the questioner, we noted that even though the GSCM framework is not implemented in the companies' plans, they still require suppliers to maintain environmental standers that show positive signs about the industry's willingness to adopt the green framework.

Several factors were indicated as a barrier to the implementation of GSCM in the Malaysian construction firms – from the survey. This research objective is one of the topics in the conference papers from this research study. It was found that the lack of public awareness, the lack of knowledge about environmental impacts, the low level of commitment by the top management, the lack of legal enforcement by the government, the lack of resources, the lack of sustainable practices in the various organizations' vision and mission, the lack of markets for recyclable materials, the lack of information-sharing between construction firms and suppliers and the lack of demands. To attain an environmentally sound supply chain in construction, the barriers in GSCM must be averted.

GSCM has a positive impact on the Malaysian construction industry. Based on the data collected from the questionnaire when asked about the benefits of green supply chain management showed that green supply chain management could have a positive impact on financial performance, improved sustainability of resources, increased efficiency, improved product differentiation, improved product competition, more vital adherence to regulations, reduction of risks, and improved quality of products.

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