Sustainability Performance Approach in Malaysia's SMEs for Improving Green Supply Chain Management (GSCM); An Application of Quality Function Deployment (QFD)

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Abstract: Many perceptions from environmental studies were claimed that environmental pollution in Malaysia is due to the failure of Green Supply Chain Management (GSCM) among Small Medium Enterprise (SMEs). There is a need to see an effective strategy to overcome the GSCM failures or to improve the GSCM in SMEs. Since, "green supply chain management (GSCM)" was introduced as a driver for sustainable performance in environmental preservations achievement throughout the supply chain. The objective of this study is to identify the key of performance for GSCM measurement in SMEs. Analysed the quantitative data by SPSS and the results show 2 factors affect the performance namely GSCM Benefits and Critical Success factor. Consumer safety contributed significantly in GSCM benefits while, high satisfaction of customers and business partners in SCs contributed significantly in critical success factor. Based on both factor of GSCM performance, this study developed a model for GSCM improvements by Quality Function Deployment (QFD) method development toward sustainability performance (Environment, Economy and Social) and operational factor has been found at the end of the result as a complementary for the improvements. The model has been validated using Linear Programming. The result OF Quality Functions Deployment (QFD) found that social is the most important parameter for GSCM improvement in Malaysia's manufacturing SMEs followed by the economy, operational, and environment. In terms of the sustainability performance impact, the model showed that social factor becomes the most important parameter for GSCM improvements, followed by economic, operation and environmental factor.

Keywords - Green supply chain management, Environmental performance, Economic performance, Operational performance, Social performance.

1. Introduction

The environmental issue that has been frequently discussed is on the occurrence of environment pollutions in Malaysia and its association to the failure in GSCM practice in SMEs [24]. The Malaysian fully owned firms have the lowest level participation of green supply chain initiatives. In fact, most of Malaysia's SMEs in Malaysia are still left behind preserving the environment as compared with large industries in developing countries. Since the environmental problems occur in Malaysia which is caused by the pollution occurred, seems to show the failure in GSCM practice for Malaysia. This failure becomes a serious issue with an increasing number of Malaysia's enterprises in Malaysia. It is not just for environmental but also gives negative impact on the business performance of SMEs and at the same time almost influenced the failure for the country to meet the standard of global demand for sustainability development. Therefore, it is necessary to identify a common strategy for the further improvements in GSCM among SMEs which is not discovered before. Since the Green Supply Chain Management (GSCM) was introduced as a driver for sustainable development performance, and there are lacking approaches in decision making over the indicators of social, environmental and economic in improvements strategy, especially in GSCM study, this study is significant to establish in economic growth, environmental-friendly and social efficiency for Malaysia's SMEs in GSCM.

2. Objective

This study is to develop a strategy for Green Supply Chain Management (GSCM) improvement by critical measurements in sustainability performance. In view, the

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drivers for successful in GSCM is no more limited to individual objectives of economic, social and environmental, but considered all internal and external factors of the stakeholders in the supply chain. Thus, the technique of Quality Function Deployment (QFD) will be proposed.

3. Scope of Research

This study is to investigate the level of GSCM achievement and the expectations of Malaysia's SME for further improvement strategy. This study focuses on small-and-medium-sized enterprise (SMEs) in the manufacturing industry. Because of the constraint and the limitations in GSCM practice among SMEs, this study has concentrated on the certain groups of manufacturing in Malaysia's SMEs for those companies practicing "green" in their industry. The groups were listed and provided by the Department of Environment from the "Green Industry Program" members. For the improvement purposes, this study emphasizes on the GSCM benefits and the critical success factor based on the sustainability development in social, environmental and economic.

4. Literature Review

4.1 Green Supply Chain Management (GSCM)

Many kinds of literature review serve to explain that GSCM is an effective approach to improve overall organizational performance, especially regarding business activities. For example, benefits of recycling refer to waste management that can be reused or reprocessed to produce the same product or otherwise by the importance of environmental and constraints of the limited resource [25],]26]. Recycling activities reduce the cost of new procurement and increase productivity [4],[13]. According to [25], greening supply chain not only makes it possible to achieve substantial cost saving, but it would also enhance sales, market share, and exploit new market opportunities, where it leads to profit margins. By adopting green supply chain initiative would allow the organization to enjoy all these benefits and contribute to increasing economic performance of the organization. On the other hand, the primary focus for the organization is to achieve profitability and sustainability in the competitive market. These have been applied for the most countries including Malaysia.

4.2 Malaysia's Green Practice toward Green Supply Chain Management

In Malaysia, the government has spent lots of budget for the promotion and execution of green technology among industry players [16] .The Malaysian government has also taken responsive action by establishing the Ministry of Energy, Green Technology, and Water in April 2009. They initiated in limiting industrial and automobile emissions and included the use of environment-friendly biomass boilers. In Taman Suria, Batang Berjuntai, Malaysia has spent over RM5 Million annually to treat effluents and emissions to meet the met requirements [7]. Malaysia has attracted top companies such as First Solar, Sun Power, Q-Cells and Tokuyama to invest in the solar photovoltaic industry through FDIs, and has collected about RM12 billion [16]. These funds enable producers and users of Green Technology to make loans to support their activities, and part of it has been considered as grants from private firms to adopt and implement the green process in their operations.

4.3 Green Supply Chain Management Practice in Malaysia's SMEs

According to Abd Rahman et al. (2014), SMEs are practicing green. There is a majority of the manufacturing industries and recognized by DOE [7] . Unfortunately, the study by [8] said that if being compared to large companies, especially foreign companies, the Malaysian fully owned firms have the lowest level participation of green supply chain initiatives. In fact, most of Malaysia's SMEs in Malaysia are still left behind preserving the environment as compared with to large industries in developing countries.

4.4 GSCM in Malaysia's SMEs

Small and Medium enterprises (SMEs) are playing vital role in development of a country's economic growth and they can be considered as backbone of economic growth in all countries [17],[10]. It has been reported that SMEs contribution to the nation's Gross Domestic Product (GDP) is 32.5 % in year 2011, and these companies aim to contribute 41% of the nation's GDP by year 2020. The Government of Malaysia has drafted plans which requires SMEs to increase workforce from 59 to 61%, increase exports from 19 to 25% and increase number of registered firms from 69 to 85% in Malaysia by year 2020 [7].

Increasing environmental concerns and awareness are the driving force which pushes manufacturers all over the world to adopt green manufacturing practices that results manufacturing SMEs to implement green practices in their business (Ghazilla et at., 2015). The role of SMEs operating in the manufacturing sector is more important in Malaysian economy [15]. Due to significant contribution of SMEs towards economy, various agencies, particularly that of

Government, have given a lot of importance on the development of SMEs. In order to strengthen the SMEs a number of programs conducted to enhance their performance [17]. Environmental issues have become a priority for the government and the public [8].

4.5 GSCM Benefits and the Critical Success Factor

According to the literature previously found that some of the benefits of GSCM implementation can be discussed in groups such as environmental benefits, economic benefits and efficiency gains. [4] also found that the benefits can be met in the implementation of the performance of GSCM. [5] found that the group interest's determination must be made on the basis of factor analysis. These findings were supported by [30] which found that interest groups should be formed according to the feedback given by the organization. Therefore, a general explanation of the benefits made to assess the potential for GSCM implementation in organizations [11]. This study has more focused on the implementation of GSCM interest earned by companies in the manufacturing sector, as shown in Table 1.

The Benefits of GSCM Implementation	[13]	[14]	[21]	[6]	[9]	[30]	[27]
Increased efficiency	x	x	x			x	
Improvement in product quality	x					x	
Increased productivity							
New market opportunities	x		x				x
cost savings		x	x	x		x	x
Increased corporate image	x			x		x	
Reduction of solid waste / liquid	x	x	x			x	
Reduction of air pollution dispersion	x	x				x	
Recycling	x		x	x	x	x	
Improvements in compliance with environmental laws	x			x		x	
Increases in product prices							
profit margins		x				x	
social responsibility	x					x	
The increase in sales	x	x				x	
market share	x						x
Increased efficiency	x	x	x	x		x	x

Table1. The Benefits of GSCM Implementation

According to[2] and [19], a critical success factor is a benchmark for successful implementation of GSCM, in fact, helps organizations gain a better understanding of the approach to be chosen. Table 2. shows the critical success factors for the implementation of GSCM identified through previously researchers.

The Critical success factor for GSCM	[13]	[30]	[19]	[18]	[18]
Identify requirements /customer focus.		x			x
Determining production procedures /operations to ensure greater efficiency.		x			x
Update the documentation to ensure that employees perform.					x
Ascertain the identity of the supplier of choice and supply information systems to inform.		x	x		
Ensure training needs and attendance records by topic.			x		x
Ensure that customer complaints are handled properly.					
Ensure minimization and commitment to abolish the non-compliance problem.		x			
Identifying the problem nonconformities.					
Ensure employee commitment.		x		x	
Engagement / employee training				x	
Benchmark.	x			x	
Commitment of top management.		x		x	

Table 2. The critical success factor for GSCM

Table 3. describes about the performance measurement in GSCM from previously researchers.

Table3. GSCM Conceptual Model for Performance Measurement in GSCM

GSCM Practice	Performance	Model
Suppliers development	Economic, Environmental and Competencies	[22]
Supplier's development, Green productivity and Green uses.	Economic, Competencies	[26]
Green productivity, R&D green and Green Marketing.	Economic, Financial	[23]
Environmental and Supplier development.	Environmental and Economic	[11]
The critical success factor, Benefits and Element.	Competency(Manufacturing)	[28]
Green Procurement, Green Manufacturing, Green Distribution and Green Logistics	Economic,Environmental and Social	[27]

There is very little attention from the study previously to optimize economic returns, environment concerns , and the social performance in green supply chain performance [29]. According to [20] performance indicators in supply chain

management should be defined to control the effort of companies in achieving sustainable development at all levels. Performance measurement has the advantages of stabilizing the GSCM process and identifying opportunities for improvement within the system cited by [22].

Given the above arguments, this study will begin to focus into SMEs for toward the sustainability performance in GSCM. It was inspired by [20] which was studied on the impacts of conventional supply chain management (SCM) practices on sustainability performance. It is worth exploring for this study. There are describes about maximal economic benefits, minimal environmental impacts and meeting the social requirements of the sustainability performance in GSCM.

4.6 Sustainability Performance in GSCM

This measurement method had widely used in many studies in large companies that have been successful in the implementation of GSCM. The method is the everlasting development in penetrating business in the global market, the practitioners of the green supply chain must not only consider the customers' demands but also try for the recycling of the matters and energy to realize the integration of economic, environmental and social benefits to achieve sustainability performance in GSCM.[21].

There are advantages to emphasize sustainability in GSCM performance because it can help the industry to make some improvement and solve to which defect and weaknesses in the practice [3]. [27] said that by optimization in achieving the sustainability in GSCM also is one of the best strategies for meeting the challenge to enhance the potential to improve the environmental performance of any organization.

The sustainability development in GSCM performance measurement contains the three basic lines are (Social, Economic, and Environmental). It was used for improvement in Supply chain management. Therefore, this study will use the sustainability accessibility in GSCM. Which is does not frequent apply in the GSCM study by previously studies. They can be used to assess the level of operations, processes and integration of sustainability in the green supply chain.

4.7 Research Design and Methodology

In this study, the basis for improvement in GSCM is highly dependent on the customer requirements. One of the methods at satisfying customers' requirements is QFD. QFD is a comprehensive quality tool specifically aimed QFD is defined as a method and technique used for developing a design quality aimed at satisfying the consumer and then translating the consumer's demands into design targets and major quality assurance points to be used throughout the production stage [1]. Hence, the aim of this study is to propose a methodology using QFD to determine the most suitable customer needs, for develop (GSCM) strategies in Malaysia's manufacturing SMEs. It will be shown as a model and designed it by QFD. There are two angles at the Model of QFD, Technical Requirements (TR) and Customer Requirements (CR). TR stands for the Critical Success Factor of GSCM and CR is stand for Benefits of GSCM. Two of these are an important factor in analyses process for coming out the result.

4.8 Proposed Model

In this study, the development the quality function deployment (QFD) is used for the success in GSCM by optimization. QFD is a structured method that uses the seven management and planning tools to identify and prioritize customers' expectations quickly and effectively. Once prioritized the attributes and qualities, QFD deploys them to the appropriate organizational function for action. Thus, QFD is the deployment of customer-driven qualities to the responsible functions of an organization. Many QFD practitioners claim that using QFD has enabled them to reduce their product and service development. Hence, it helps this study to derive the optimization toward success in GSCM.

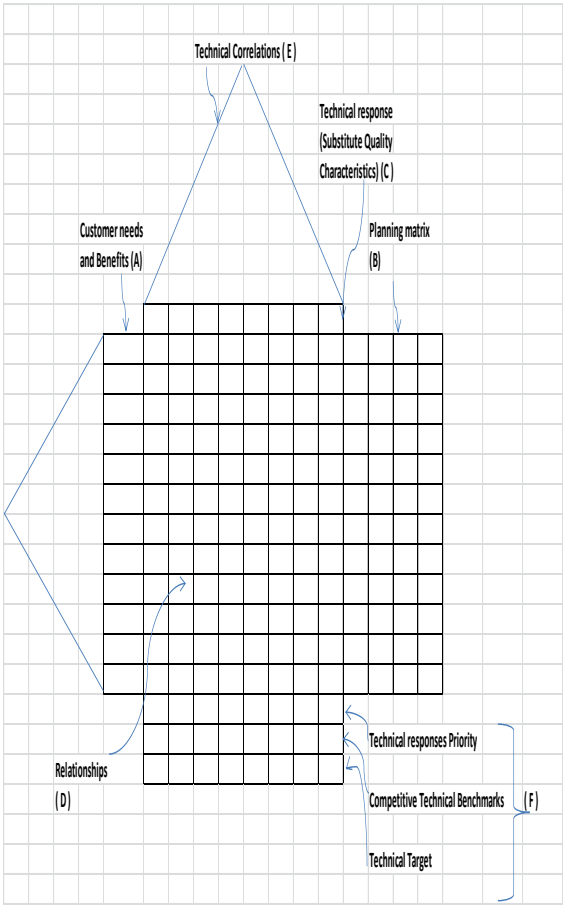

Figure 1. The foundation of the QFD

The process of using appropriate HOWs to meet the given WHATs is represented as a matrix. Five sets of input information are required in a basic QFD model: (i) WHATs; (ii) importance of WHATs; (iii) HOWs; (iv) correlation matrix; and (v) relationship matrix which are shown systematically in the research methodology section.

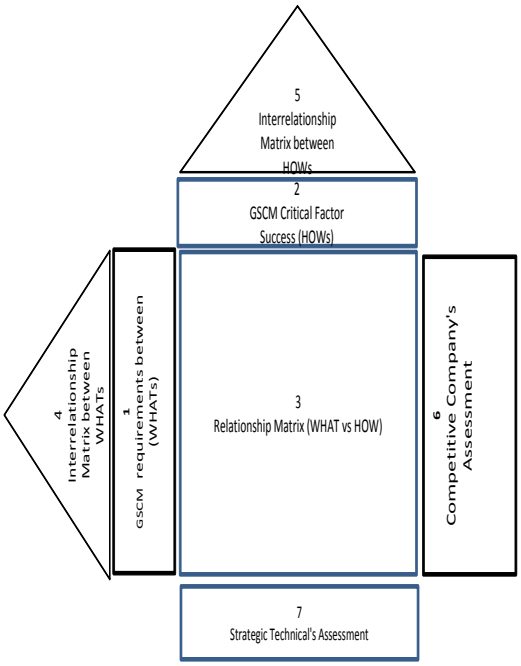

Figure 2. The Proposed Model of QFD development in GSCM

Figure 2 shows the final QFD model for this study. The model was complement based on the foundation of the QFD development which comprised of some factors and integrated with SPSS analysis. There are 7 rooms in these proposed models ; Room 1 GSCM Benefits (WHATs); Room 2 Critical Success Factor of GSCM (HOWs); Room 3 Relationship Matrix; Room 4 Develop an interrelationship matrix between HOWS; Room 5 Develop an interrelationship between WHAT; Room 6 SMEs GSCM practice Benchmarking Assessment and Room 7 Strategic Assessment. In this proposed model, SPSS used by the Factor analysis for determined priority group from the items. It was also used to remove the unused items. Then Spearman correlation was employed to measure the relationship between the two of WHATS and HOW. Linear programming acts as validation for testing the models.

4.9 Model for Improving GSCM

The Results from earlier steps in the QFD development process (in eight steps) is used to develop a complete model for GSCM Improvement in (Figure 3). It is a reflection of the model design with fully based on TR and CR which are combined in one form and place. It makes it easy for managers or responsible parties, sees the need in a once time and one place for decision making in the supply chain performance improvements by taking into account the needs of all parties.

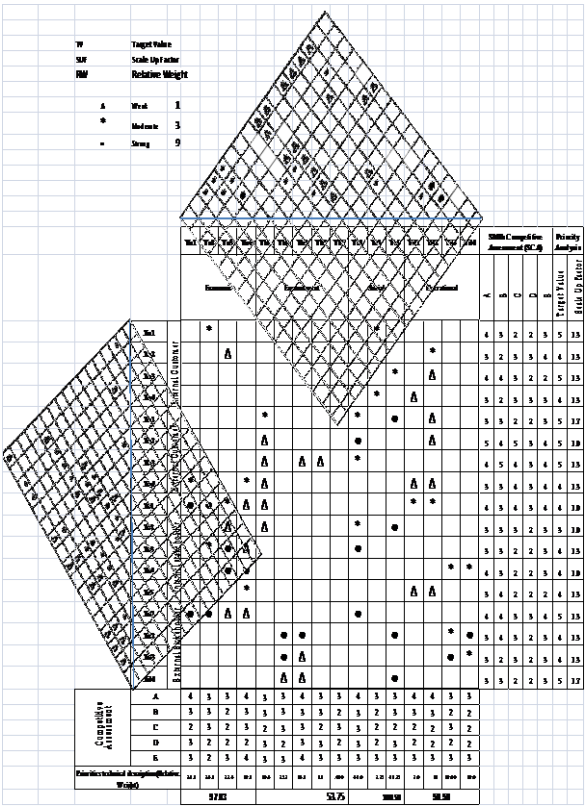

Figure 3.Model for GSCM Improvement

Summary

The GSCM design is a strategic decision that integrates the objectives of economic benefits, environment concerns, and social requirements to achieve improvement in green practice performance in processes, activities, and operations throughout the supply chain. Using the QFD analysis, able to integrate the Economic, Environmental, Social and Operational dimensions altogether. Variables addressing these dimensions from customer requirements and technical requirements point of view were studied in detail. practical to be implemented or not for SMEs.

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