

## Adoption of Green Supply Chain Initiatives among Small and Medium Sized Suppliers

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### Abstract

Even though green supply chains have been proven to lessen environmental issues and provide economic benefits, little is known about green supply chains, especially in the perspective of Malaysia. This paper aims to describe what factors drive small and medium-sized suppliers in participating in green supply chain initiatives. The data collection instrument for this research is through questionnaires. Results indicated that the supplier's supply chain readiness, buyer's influence and government involvement drive suppliers to participate in green supply chain initiatives. Indeed, the readiness of the supply chain was the most important factor that drives the participation of SME and followed by the buyer's influence and finally the government involvement.

**Key words :** Supply Chain Initiatives, Small and Medium-sized Suppliers, Malaysia

### 1. Introduction

Environmental issues have become a notably prevalent concern for governments, societies and business organizations. With environmental problems such as global warming, ozone depletion, solid waste and air pollution, business organizations are considered to be the source of most of the environmental problems. The most common thought that comes to mind when it comes to going green is the basic act of recycling, reusing and reducing. There are many avenues in which a company can contribute to go green. For the purpose of this study, the focus will be on the supply chain. Green supply chain practices range from green purchasing to integrated supply chains flowing from suppliers, to manufacturers, to customers and to the reverse supply chain which is "closing the loop" (Zhu and Sarkis, 2006; Rao and Holt, 2005). In Europe, multinational enterprises have started to enforce regulations and "green barriers" to protect themselves from devastating environmental effects on the suppliers (Jimenez and Lorente, 2001; Rao, 2006). The objective of green supply chain is to eliminate or minimize negative environmental impacts (air, water, and land pollution) and waste of resources (energy, materials, products) from the extraction or acquisition of raw materials up to final use and disposal of products (Hervani, Helms & Sarkis, 2005)

## 2. Literature Review

Since the middle of the twentieth century, there has been a dramatic increase in the consumption of resources such as water, mineral fertilizers, fossil fuels, paper, as well as increased levels of deforestation and greenhouse gas emissions, particularly CO<sub>2</sub> (Stern, 2006). The popular use of the term “green” can refer to either a product or a process. The concept of green is currently widely applied in the technological sector. According to Kahlil (2009), technology can be defined as all the knowledge, products, processes, tools, methods and system employed in the creation of goods or in providing services. The field of “green technology” encompasses a continuously evolving group of methods and materials, from techniques for generating energy to non-toxic cleaning products.

### 2.1 Drivers of Green Supply Chain Initiatives

Based on past studies, three drivers have been identified for the purpose of this study. They are the government, buyer influence and the SME supplier itself.

#### 2.1.1 Government

Domestic environmental regulations prompt companies to adopt relevant strategies and practices to enhance their environmental performance (Chien & Shih, 2007). In addition, the major drive for corporation environmental awareness is increasing the role of government regulation (Handfield, Walton, Seegers and Melnyk, 1997). For example, in an effort of the Malaysian government to encourage firms to carry out environmental initiatives or avoid harmful impacts on the environment, the government offers various environmental incentives for the manufacturing sector such as capital rebate for up to 50% for purchase of recycling machineries and exemption on import duties as well as sales tax for such machines (Rao, 2004). The government has big influence on a firm’s environmental practices. It can be seen that governments’ involvement and pro-active initiatives are seen as one of the crucial elements that guides firms towards sustainable practices that benefit not only the environment, but the firms itself.

#### 2.1.2 Buyer Influence

Jabbour&Jabbour (2009) said that supplier participation in providing direct inputs for manufacturing companies has intensified in recent years. They went further on to add that suppliers have been increasingly seen supporting customer quality improvements processes (continuous improvement), working together in customer product development activities (early supplier development) and in production inside customer production units (modular consortium). It is the company’s responsibility in establishing a set of selection criteria in supplier selection. This can be explained by Prahalad and Hamels’ (1990) where it can be seen that companies which emphasize their internal competence demand greater ties to supplier to support non-central activities of the production system.

More lead companies in supply chain increasingly invest much time and energy in developing the environmental capability of their suppliers because they have come to realize their environment goals cannot be accomplished by their environmental capability alone (Lee, 2008). Vachon and Kelsen (2006) stated that the integration between a buying organization and its suppliers is undertaken to improve the operations in the buying organization and/ or the supply network. Screening of suppliers for environmental performance has now become a key deciding factor in many organizations (Clark, 1999).

#### 2.1.3 Supply Chain Readiness

It is a common occurrence that cooperation amongst business partners in a supply chain is a hard undertaking. Major changes are expected from SME suppliers who want to adopt a green practices in their business. Their attitude towards green supply chain initiatives may differ. Their internal characteristics play a major role in determining their perception of green supply chain initiatives. These internal characteristic are made up of information, technical know- how and resources.

In this paper, these internal characteristics are referred to as green supply chain readiness. Lee (2008) stated that GSC readiness can be measured by range of diverse indicators, including manager environmental awareness, cross functional environmental communication and human, technical and financial slack resources.

For managers, the challenge is to identify, develop, protect and deploy resources and capabilities in a way that provides the firm with a sustainable competitive advantage (Amit & Schoemaker, 2007). A manager's understanding of steps and measures to be taken is important. Information and awareness are all linked to how a firm reacts to green supply chain initiatives.

It is important that a firm has the right technical know-how in order to be able to keep up with emerging new techniques, processes and technologies. In alignment with this, Hemel and Cramer (2002) found that alternative solutions in product design to fulfil the design for environmental requirement in SMEs were not found. Making changes and taking part in green supply chain initiatives require major changes in technical, financial and human resource. The key reason most firms do not take up green supply chain initiatives is because of the major changes which are required in these areas.

## **2.2 Supply Chain**

The traditional supply chain is defined as an integrated manufacturing process wherein raw materials are manufactured into final products, then delivered to customers via distribution, retail, or both (Beamon, 1999). Normally, several independent firms are involved in manufacturing a products and placing it in the hands of the end user in a supply chain- raw materials and components producers, product assemblers, wholesalers and retailers merchants are all members of a supply chain (La Londe & Masters, 1994).

## **2.3 Green Supply Chain**

Kim and Min (2011) stated that despite the widespread attention of green initiatives, the terminology "green" is loosely defined or not defined at all. Though "green" may generally refer to "eco-friendliness" or "sustainability", its focus has been predominantly reactive compliance with environmental regulations or public demand (Kim & Min, 2011). One of the short coming in this current situation is that majority of the supply chain literature rarely include the concept of green into its supply chain performance measures. Therefore it was not considered as a value-adding activity or a competitive edge. However, this notion may change once being "green" can be equated to being "lean" (Kim & Min, 2011). When waste is minimized as part of being green, it results in being lean with the better utilization of natural resources and the subsequently improved efficiency. In other words, improved environmental performances of the firm can be translated into tremendous competitive advantage and will lead to improved revenue, increased market share and more positive corporate image.

## **2.4 Green Supply Chain Initiatives**

Holt, Anthony and Viney (2001) identified seven types of GSC initiatives which support SMEs in improving their environmental performance by classifying the organizations involved in arranging them: governments, trade associations and sector bodies, partnership groups, individual companies, business support organizations, non-for-profit green business-support organizations, and green business clubs. Although Holt *et al.* (2001) used the term of environmental business-support services interchangeably for green or GSC initiatives, the meanings of the terms are exactly the same. In their classification, the company-driven initiative is equivalent to the buying firm-led GSC initiative and other organizations-driven initiatives are equivalent to the third party-led GSC initiative in this paper. More often than not SME suppliers are a source of environmental risk and a bottleneck in pursuing the goal of a greener supply chain. In this situation, GSC initiatives are thought to be one of the key mechanisms used to diffuse more advanced environmental management to less environmental capable SME suppliers (Lamming and Hampson, 1996).

In the 2010 Malaysia Budget, the Prime Minister announced a RM1.5 billion fund to advance the producer and users of green technology. These funds enable producers and users of Green Technology to make soft loans to finance their activities. But lot of companies in Malaysia are still behind and yet to adopt the green supply chain concept in their business strategy (Goh and Zailani, 2010). Malaysian fully owned firms have the lowest level participation of green supply chain initiatives compared to foreign based companies (Eltayeb and Zailani, 2009). A supply chain base as well as a country's base might primarily consist of SMEs. Therefore the involvement of SME suppliers is vitally important in achieving national or corporate environmental targets (Holt, Anthony and Viney, 2001). However less attention has been paid the SMEs who were suppliers within the supply chains. As a result, SME suppliers can be treated as missing links between SME environmental management and green issues in supply chain (Lee, 2008). This research aims to define the drivers that would motivate participation of SMEs in green supply chain initiatives. The objectives of this study are:

1. To identify the most critical factor that drives participation of small and medium-sized suppliers in green supply chain initiatives.
2. To find out the relationship between the drivers of small and medium-sized suppliers in participating in green supply chain initiatives.

### **3. Methodology**

This study employed a quantitative method for data collection. A quantitative research method is used because its results are conclusive in its purpose how common it is and attempts to generalise the result to the general population. The data collection method involves selected respondents answering questionnaires. There are two types of method by which data can be collected, which is through interview and survey. Due to the time constraint of this research, questionnaires will be administered to be able to cover a significant amount of respondents.

#### ***3.1 Population and Sampling***

The population of this study is SMEs of electrical and electronics industry in the state of Malacca. The sample must have sufficient size to warrant statistical analysis (Castillo, 2009). The sampling population represents manufacturing suppliers in the state of Malacca in the electrical and electronic industry. The population for this research was taken from the SME Corp's directory of companies in the manufacturing sector. There are a total of 65 companies in the state of Malacca. According to Krejcie and Morgan's table for population sampling, the sample size for this research was 56. The appropriate person to get the required information from should ideally have knowledge about the two aspects. The respondents of this research were mainly the general manager and top managers of the firm from sales, production, operation or planning department.

#### ***3.2 Data collection***

A questionnaire was used as an instrument for data collection in this study. Questionnaires are efficient in terms of being able to gather large amounts of data at reasonably low cost and effort compare to other methods like observation (Muijs, 2004). The questionnaire were prepared and distributed to the respondents through both e-mail and mail.

#### ***3.3 Research Instrument***

Survey Questionnaires were design in order to obtain data required. The questionnaires contained four sections: Section A, Section B, Section C and Section D as indicated below:

Section A	General Information
Section B	Drivers of participation of small and medium-sized suppliers in participating in green supply chain initiatives.
Section C	Willingness to participate in green supply chain initiatives.
Section D	Suggestion for companies green initiatives

**3.4 Data analysis**

To analyse the data, *Statistical Package for Social Science (SPSS)* software was used. Statistics has two major components: Descriptive statistics and inferential statistics. Descriptive Statistics is the discipline of quantitatively describe the main features of a collection of data whereas Inferential statistics provides procedures to draw inferences about a population from a sample. Results were then interpreted through the interpretation of statistic, graphs and percentage frequency. Results indicated that data from this study was normally distributed.

**4.0 Results**

Data that were collected through questionnaires were processed and analysed using *Statistical Package for Social Science (SPSS)*. In total, 30 companies in the electrical and electronic industry of SME’s in Malacca. The respondents were mainly general managers of the companies; however, some of the respondents were managers of production and operation, environmental management and the human resource department. The total population of manufacturing electrical and electronic companies in Malacca that was identified is 65. According to Krejcie and Morgan’s table, the sample size for this study should be 56. Out of the 60 questionnaires that were distributed, 30 of them were returned successfully. This gives the response rate of 50%.

**4.1 Mean Score and Standard Deviation**

Mean score and standard deviation analysis was done to determine the frequency of answers given by the respondents based on the factor which would drive the participation of SME’s in taking up green initiatives. Based in Table 1, the factor with the highest tendency to drive company participation is green supply chain readiness with a total average mean score of 3.68 followed by buyer’s practices with an average mean score of 3.23 and government involvement which scored 3.1 which means that these two factors have moderate tendency to drive the participation of SME’s.

**Table 1: Summary of Mean Score and Standard Deviation**

Item	Average Mean Score	Standard Deviation	Tendency
Supply Chain Readiness	3.68	0.864	High
Buyer's Influence	3.23	0.993	Moderate
Government Involvement	3.1	0.805	Moderate

**4.2 Supply Chain and Willingness to Participate in Green Supply Chain Initiatives**

The Pearson Correlation value between supply chain readiness and company’s willingness to participate is 0.719. It showed that there was a strong correlation between these two variables.

**Table 2: Correlation between Supply Chain Readiness and Willingness to Participate**

		Supply Chain Readiness	Company Willingness to Participate
Supply Chain Readiness	Pearson Correlation	1	.719**
	Sig. (2-tailed)		.000
	N	30	30
Company Willingness to Participate	Pearson Correlation	.719**	1
	Sig. (2-tailed)	.000	
	N	30	30

\*\* . Correlation is significant at the 0.01 level (2-tailed).

The significance level (2-tailed) from the table is 0.000. It can be concluded that there was a statistically significant correlation between these two variables. The null hypothesis was then rejected and there was a significant relationship between the readiness of the supply chain and company's initiatives in participating in green supply chain initiatives.

#### **4.3 Buyer's Influence and Willingness to Participate in Green Supply Chain Initiatives**

The Pearson Correlation value between buyer practices and company's willingness to participate was 0.666. Thus, it indicated that there was a moderate correlation between these two variables.

**Table 3: Correlation between Buyer's Influence and Willingness to Participate**

		Buyer's Influence	Company Willingness to Participate
Buyer's Influence	Pearson Correlation	1	.666**
	Sig. (2-tailed)		.000
	N	30	30
Company Willingness to Participate	Pearson Correlation	.666**	1
	Sig. (2-tailed)	.000	
	N	30	30

\*\* . Correlation is significant at the 0.01 level (2-tailed)

The significance level (2-tailed) from the table was 0.000. It can be concluded that there was a statistically significant correlation between these two variables. The null hypothesis was then rejected and there was a significant relationship between buyer influence and a company's initiatives in participating in green supply chain initiative.

#### **4.4 Government Involvement and Willingness to Participate In Green Supply Chain Initiatives**

Government involvement scored 0.563 in Pearson's Correlation test which showed a moderate correlation between these two variables. The significance level (2-tailed) is 0.001.

**Table 4 : Correlation between Government Involvement and Willingness to Participate**

		Government Involvement	Company Willingness to Participate
Government Involvement	Pearson Correlation	1	.563**
	Sig. (2-tailed)		.001
	N	30	30
Company Willingness to Participate	Pearson Correlation	.563**	1
	Sig. (2-tailed)	.001	
	N	30	30

\*\* . Correlation is significant at the 0.01 level (2-tailed).

The null hypothesis was rejected and there was a relationship between government involvement and company's initiative in participating the green supply chain initiatives.

## 5.0 Discussion

### 5.1 Green Supply Chain Readiness

From the result, it can be seen that the participation of SME suppliers was directly related to their readiness. Other than being the scored highest in mean score, it also showed the most critical factor in driving companies to take up initiatives in going green. As suggested earlier, the internal characteristics that play a major role in determining their perception of green supply chain initiatives include information, technical know-how and resources. The readiness of the companies consists of internal slack resources and organizational capabilities which were shown to be the most influential determinant for SME suppliers to be involved in green supply chain initiatives. This was supported by Lee (2008) who stated that GSC readiness can be measured by range of diverse indicators, including manager environmental awareness, cross functional environmental communication and human, technical and financial slack resources. Different companies have different capabilities and resources which sets them at different levels of taking up green initiatives. A resource based view of the firm as suggested by Lee (2008) contends that differences in a firm's performance could be explained by the specific resources and capabilities that they own and therefore can be applied to even SME suppliers. The readiness of the supply chain includes the level of awareness among the managers and the availability of internal recourses.

### 5.2 Buyer's Practices

Based on this study, it was evidenced that buyers play an important role as well. With a moderate mean score of 3.23, the buyer's still impact the decisions that companies take towards taking up green initiatives. One of the most influential drivers that pushed companies to take up green initiatives was actually their customers. Jabbour&Jabbour (2009) said that supplier participation in providing direct inputs for manufacturing companies has intensified in recent years. Therefore the study was consistent with the previous findings that showed a direct supply relationship and direct involvement of buyers in supplier practices that led to greener suppliers. Vachon and Kelsen (2006) stated that the integration between a buying organization and its suppliers is undertaken to improve the operations in the buying organization and/ or the supply network. Vachon and Kelson's study resulted in the support that there was a strong positive linkage between technological integration and environmental collaboration with both primary suppliers and major customers. With buyers pressuring and encouraging their suppliers, it drove SME suppliers to improve their environmental capability and results in them participating in green supply chain initiatives.

### 5.3 Government Involvement

The least influential factor that drove the participation of companies to go green was the involvement of the government. Previous study suggested that the government should be a major factor in driver base on their roles in the country (Zhu and Sarkis, 2006; Chien and Shih, 2007; Handfield, Walton, Seegers and Melnyk, 1997). Being the least influential factor, majority of the companies did not perceive the role of the government as an important factor in going green. As a matter of fact, the companies were not aware of the initiatives that the government has taken to coordinate and promote green initiatives. In fact, the government offers various environmental incentives for the manufacturing sector such as capital rebate for up to 50% for purchase of recycling machineries and exemption on import duties as well as sales tax for such machines (Rao, 2004).

### 6.0 Conclusion

Companies are beginning to realise the importance of going green and thus they have strengthen their commitment to sustainability as the benefits become more apparent. Championing sustainability allows businesses to align deeply with their missions and engage customers on a more meaningful level. There is an increase attention being paid to the importance of green supply chain initiatives and organizations are motivated to improve their environmental performance as well economic efficiency. There can only be successful if all the players in the supply chain play their part in greening the supply chain, in particular SME suppliers. Many of SME supplier's environmental management practices can be heavily influenced by larger buying firms. Larger buying firms can help SME by providing certain guidelines and support their suppliers. Although it is understandable that many SME supplier are lacking in their resources and technical know-how, this can be changed if they put in more effort and cooperating with the government. The government offers funding and tax exemptions to those who take up green initiatives. Therefore SME suppliers can take note of these efforts and make use of the benefits offered to them. As managers of the company, there are some steps and strategies that can be implemented to improving the company's environmental practices. By improving themselves on the awareness through training and education, they will be able to integrate environmental function into making strategic decisions as well as allocating resources to implement proper environmental management systems.

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