Development of Green Supply Chain Management in Food Industry

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Abstract

This paper presents the level of accomplishment and consideration of green supply chain management (GSCM) and demonstrate the economical and environmental influences of green supply chain management on the outcomes of a food-manufacturing factory in Malaysia. Questionnaires consist of 40 questions have been developed from previous studies and literatures. The questionnaires were sent to different departments of a company. Normality, reliability, t-test, correlation, and regression were used to analyze the data. The results represent that the company's current consideration and implementation of GSCM is in moderate level, and it is also found that despite the fact that applying green supply chain management requires additional costs, it provides benefits and advantages for the company, and the value of the benefits is known to be higher than costs of implementing GSCM. The highest effect of GSCM is on brand image of the company, and the return on investments, meaning that it not only makes good business sense, but also creates opportunity to stay competitive in the market.

Keywords: Project, factors influencing, risk analysis, risk awareness

1. Introduction

Since the early 1990's, manufacturers were under pressure to consider Environmental Management (EM) in all supply chains [1]. Green Supply Chain Management (GSCM) has emerged to cover environmental issues of supply chain and is generally defined as implementing environmental management throughout the entire supply chain [2]. Green Supply Chain is then the attempt to measure, analyze and improve performance among various members to ensure that companies are operating in environmental friendly manner [3]. All food products move through a "food

supply chain" that includes agriculture, manufacturing, packaging, wholesaling, retailing and consumption with transport between all the steps. Figure 1 shows the general framework of food supply chain.

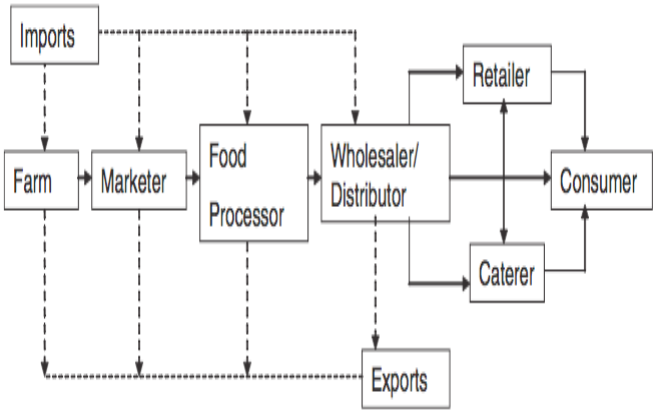

Figure 1. Food supply chain

2. Problem Statement

The supply chain consists of many stages. It is not limited to producers and suppliers. All sections involved in manufacturing such as transporters, warehouses, retailers, and also customers are included in the supply chain [1]. According to this definition, there are five areas in the company, in which the decisions affect the supply chain: production, location, transportation, Inventory and information flows.

Supply chain consists of three main parts, which are supply, manufacturing, and distribution. Each of the parts in supply chain can cause pollution and danger to the environment. For example, a company may use lead, which is very dangerous for environment, as a raw material in its production. Another example could be global warming due to the increase in amount of greenhouse gasses present in air by manufacturing companies. General public and companies are focusing on environmental problems because they can cause conflicts in many directions, and if not addressed at this moment, they can even lead to mankind extinction [2].

According to [4], within companies in Malaysia, mainly the larger companies where the headquarters are from the USA, UK, Japan and other European countries have taken the challenge to promote green practices. For the local manufacturing industries, many if not all of them are still having the attitude of wait and see.

According to [5], companies with traditional view of environmental activities think that these initiatives are not economical and they have the attitude that it generally generates negative returns to shareholders. Many companies still have this attitude, and that is the main reason for not implementing green initiatives properly even within companies that believe environmental concerns are very important. Profitability is a very important issue of concern in all industries, and many companies do not inject green initiatives properly in their activities to avoid increase in costs. It is clear that green supply chain management implementation needs additional spending, which result in increasing the costs, but the main issue is whether it is economical to spend on green supply chain management initiatives.

The objective of this study is to examine how well the environmental concerns and green supply chain management is being indicated and implemented in the activities of Dutch Lady Malaysia Company, and to examine the effects and influences of green supply chain management implementation on economical and environmental situation of the company.

3. Project Methods

The method used in this thesis is questionnaire. The questionnaire items are built based on the knowledge and attitude of industrial experts and the literature of this thesis. According to [6], the use of a self-completion questionnaire has several advantages. The cost and weight involved the large sample size is reduced. Compared with mail or personal and telephone interviews, being quick to administer is an advantage.

The questionnaire contains three sections and the respondents are asked to answer questions using a five-point Likert-type scale. Respondents of the questionnaire are managers and executives of departments of administration/planning, manufacturing, environment and safety, and logistics. The first section of the questionnaire is demographic profile, which consists of 6 questions about the characteristics of the respondent, like gender or job title. The second part of the questionnaire is assessment of green practices, and consists of 15 questions about the company's current status and level of accomplishment in GSCM practices. Respondents are asked to select the most proper answer for each question on the following scale:

1) Very poor
2) Poor
3) Average
4) Good
5) Excellent

The third part of the questionnaire consists of 19 items related to the economical and environmental effects and influences of implementing green supply chain management in the company. These items demonstrate the changes in economical and environmental situation of the company after implementing green supply chain management. Respondents are asked to state their answers on the following scale:
1) Significant decrease
2) Decrease
3) No effect
4) Increase
5) Significant increase

40 questionnaires were sent to different departments of the company. The population size of the company is 465 and the sample size is 40. All the data collected from respondents are analyzed with IBM SPSS STATISTICS software. The results not only present the current situation of the company regarding green initiatives, but also demonstrate the effects of GSCM implementation on the economical and financial situation of the company.

4. Results and Discussion

a. Demographic Profile

The demographic profile of respondents is useful in providing an understanding of respondent's characteristics that might influence their judgments [7]. These characteristics included gender, marital status, age, educational level, job title, income, department of participation, and length of service in the company. Figure 2 shows result of distribution of respondents based on the academic qualifications.

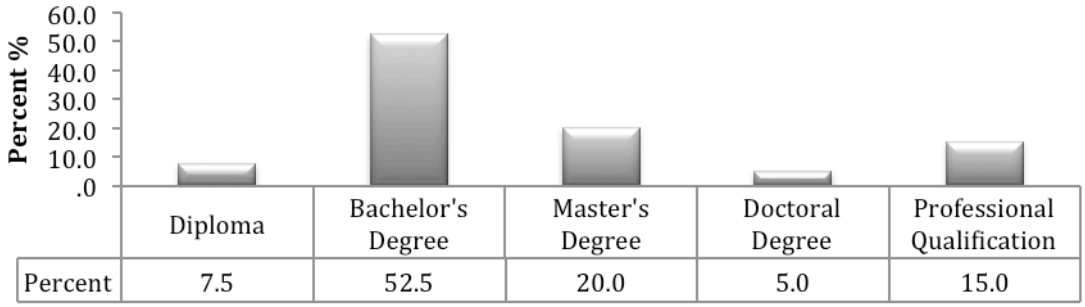

Figure 2. Distribution of Respondents based on academic qualifications

b. Assessment of green supply chain management

The assessment of GSCM consists of 4 dimensions:

i. Commitment
ii. Consideration
iii. Green Purchasing
iv. Eco Design

The results show most of the respondents believe that commitments of all levels of managers and executives are at the average level. But it is obvious from the data that upper managers and middle managers are more likely to have commitments above average level, with 25 percent of upper managers and 35 percent of middle managers having commitments higher than average level. For consideration criteria, around half of the respondents believe that there is an average level of green supply chain management consideration and total quality environmental management accomplishment in the company.

For green purchasing criteria, a considerable percentage of respondents believe that cooperation with suppliers for environmental objectives and consideration of second-tier suppliers' environmentally friendly practices are at a poor level in the company, while the Table 1 shows an average level of company's consideration of suppliers' ISO14000 certification.

Finally for eco design criteria and for all five questions, the highest percentage of respondents' opinion goes for the average level. It is witnessed that 37.5 percentage of respondents think that the company's cooperation with customers for using less energy during product transportation is poor, and 27.5 percentage of respondents have the same opinion for company's cooperation with customers for eco-design, company's consideration of eco-design in designing the products, and the cooperation with customers for green packaging. Table 1 shows the summary of mean value for the four dimensions in assessment of green supply chain management.

Table 1 Mean value for GSCM assessment

	N of items	Mean	Std. Deviation	Std. Error Mean
Commitments	4	**2.862**	.725	.115
Considerations	3	**3.125**	.791	.125
Green Purchasing	3	**2.792**	.914	.145

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Eco Design	5	**2.825**	.658	.104

c. GSCM outcomes

This section evaluates affects of implementing green supply chain management on the four dimensions:

i. costs and expenses,
ii. economical and financial benefit
iii. company's brand image
iv. affects of green supply chain implementation on pollutions and waste caused by the company.

Table 2 shows the mean value for dimensions of GSCM outcomes. It shows costs, benefits, and brand image dimensions are above the mean of scale, which means that they are above the moderate level, and in this section of survey, the average value of scale has the meaning of "no effect". So in the respondents' point of view, by implementing green supply chain management, the outcomes would be increase in cost, increase in benefits, and increase in brand image of the company. It is witnessed from Table 2 that benefits are more likely to increase, compared with costs, as the mean value of this dimension is higher than other two dimensions. The same result is acceptable for brand image. But for pollution, the mean value is lower than the average level, and according to previous analysis, it should be considered as the previous scale, which is "slight decrease". So it is concluded that in respondents' point of view, by implementing green supply chain management the pollution caused by the company will decrease.

Table 2 Mean value for dimensions of GSCM outcomes

	N of items	Mean	Std. Deviation	Std. Error Mean
Costs	9	**3.731**	.667	.105
Benefits	6	**3.925**	.644	.102
Brand Image	2	**3.962**	.957	.151
Pollution	2	**2.075**	.944	.149

5. Conclusion

The conclusions from this study are:

1. The company has an average level of green supply chain management consideration and implementation. The results of assessment of green supply chain management in the company shows that within the activities related to GSCM, the consideration of environmental standards such as ISO14000 and total quality environmental management practices are in a better situation compared with commitment of managers and executives to GSCM, green purchasing practices and eco design consideration.
2. Although the implementation of green supply chain management will increase costs, such as manufacturing cost, raw material purchasing cost, inventory cost, training cost, and costs occurred by increasing manufacturing lead-time and maintaining the on-time delivery, it also will increase the benefits of the

company, such as profit and return on investment and total sales, and it was seen in the figure of mean values of dimensions that after implementing green supply chain management, the changes in benefits is more than the changes in costs.

3. By comparing the mean value of the effects of implementing green supply chain management in different dimensions, it was observed that the brand image has the highest mean value, meaning that implementing GSCM practices in the company strongly improves the brand image of the company.

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Biographies

Ahmaad Aldeehani is a PhD research student in the field of Manufacturing Engineering at Universiti Putra Malaysia. He is also chemical engineer and had Master degree in Engineering Management.

Shamsuddin Sulaiman is a Professor in the Department of Mechanical and Manufacturing Engineering, Universiti Putra Malaysia. His major field is Manufacturing Engineering especially in Metal Forming such as casting technology and forging includes simulation/modeling and experimental works. He received his PhD from University of Wales, United Kingdom in 1992. He had involved various administration posts in the university. He leads the department in advanced material research group especially on the metal composite materials. He managed to supervise more than 40 PhD students and published more than 300 International journal and conference papers. He received many recognitions from various organizations, national and international level. Currently he concentrates on manufacturing engineering especially processing of new materials include metal and nonmetal composite products .

Faizal Mustapha is a Professor in the Department of Aerospace Engineering, Universiti Putra Malaysia. His major field is in Structural Health Monitoring especially in Composite and Hybrid Composite. His nature of research mainly focusing in experimental and simulation/modeling works. He received his PhD from University of Sheffield, United Kingdom in 2006. He had involved various administration posts in the university. He managed to supervise more than 20 PhD students and published more than 100 International journal and conference papers. He received many recognitions from various organizations, national and international level. Currently he concentrates on Renewable Energy especially on Smart Vertical Wind Turbine blade and functional materials for Photovoltaic applications.

Assoc. Prof. Dr. Faieza Abdul Aziz is a lecturer and researcher from Universiti Putra Malaysia. She graduated in B.Eng. (Hons) Mechanical Engineering from University of Bradford, UK. She obtained her PhD at Cardiff University, UK in Systems Engineering field. She has more than 100 publications in international journals and conferences. She authored five books and five chapter in books on topics related to virtual reality, augmented reality, manufacturing engineering, modelling and simulation systems.