
Environmental Sustainability Performance: The Influence of Supplier and Customer Integration

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Environmental sustainability has emerged from many organizations as a mainstream issue that companies can no longer afford to ignore. Factors such as global climate change and environmental degradation; the depletion of natural resources; and the increasing recognition of the corporation's role as an agent of economic and social change stimulated the interest in the performance of sustainability. Sequentially, these 'sustainability' issues are started to be appreciated as affecting a company's investment value, its risk profile and its future assets and liabilities. It was suggested that one of the ways to support environmental sustainability is through environmental collaboration between firms and its supplier and customers or in other words, supplier and customer integration. This paper aims to provide empirical evidence on the influence of supplier and customer integration on environmental sustainability performance. With the purpose of obtaining information needed, a survey was conducted on ISO14001 certified manufacturing firms in Malaysia. Data from 107 companies were received and analyzed by correlation and regression analysis. Based on the results of data analysis, the variables were verified to have statistical significant associations with environmental sustainable performance. Therefore, it can be concluded that supplier integration and customer integration are strong predictors on environmental sustainable performance among MS ISO 14001 certified manufacturing firms in Malaysia. The findings of the study probably contribute in policy development of manufacturing practitioner.

Keywords: Supplier Integration, Customer Integration, Environmental Sustainability Performance, Manufacturing Firms,

1.0 Introduction

Each country is facing with different pressures particularly where environmental issues are concerned (Christmann and Taylor, 2001). According to International Energy Annual Report (2007), manufacturing industries are significantly responsible for the consumption of a huge amount of resources and waste generation globally. Manufacturing sector is also responsible for emission of 36% of carbon dioxide (CO₂) in the world (OECD, 2009). To fulfill environmental obligations, organizations recognize that they cannot work in isolation. Sustainability is a brilliant way of performing business, and one of the essential parts of sustainability transition process is developing innovative and constructive corporate culture through integration (Chen et al. 2010). Therefore, renewed focuses on the impact of manufacturing industries' stakeholders such as the regulatory makers, shareholders, customers, and employees have been requiring firms manufacturing organizations to be more responsible toward the environments with respect to their products and the process (Amrina and Yusof, 2011). Governmental laws and regulations as well as public consciousness of environmental effects have been the main drivers of green supply chain and corporation sustainability (Liu et al., 2012). In order to ensure efficient integration of the entire supply chain process, green practices are needed to be applied simultaneously rather than independently (Kim, 2006). However, the integration practices involving the likes of suppliers and customers across the entire green practices remain unclear (Yu et al., 2014).

Many firms in developing countries like Malaysia are still learning on how to incorporate green practices through their daily operations (Rao, 2002; Sarkis, 2012). Constant study is required for managerial and practical contribution. The findings of the study could provide beneficial information in helping manufacturing companies to identify effective approaches towards successful green supply chain practices as well as ensuring their sustainable performance. Specifically the objectives of the study are to determine the influence of supplier integration on environmental sustainability performance, and to determine the influence of customer integration and environmental sustainability performance in manufacturing sector. Besides that, this study also attempts to identify the best predictor influencing the environmental sustainability performance between the two variables.

2.0 Literature Review

Environmental concerns and conscious are driving business firms to look onto their operational impacts. Referring to Junquera et al. (2012), environmental sustainability performance is defined as "the evaluation of organizational reduction for emissions, decrease of consumption for hazardous or harmful materials, and efficient energy or resources use". Environmental sustainable performance is 'achievements in reducing the resource usage, pollution emitted, and waste generated resulting from the undertaken efforts (Brent' and Labuschagne', 2004). Environmental sustainability performance is also strongly related to environmental goals of organization including the decrease of frequency for environmental accidents and solutions to improve an enterprise's environmental situation (Chien and Shih, 2007). The environmental performance can also be a useful indicator in decreasing environmental risks, as well as supporting external communication and policy-making for both public and private sectors (Mazzi et al., 2012).

According to IEA (2007), manufacturing industries are significantly responsible for the consumption of a huge amount of resources and waste generation throughout the world. From 1972 to 2004, there was an increase of 61% in the consumption of energy by manufacturing industries which consists of a third of the global usage of energy. Apart from being the main cause of environmental issues like increasing levels of pollution, overflowing waste sites, and diminishing raw material resources, manufacturing sector is also responsible for emission of 36% of carbon dioxide (CO₂) in the world (OECD, 2009). Therefore, a renewed focus on the impact of manufacturing industries' stakeholders such as the regulatory makers, shareholders, customers and employees have been shifted to seeking from the manufacturing organizations to be more responsible to their environments with respect to their products and the process (Amrina and Yusof, 2011). The concept of sustainable manufacturing practices relates toward the procedures, policies, and the techniques used by firms in monitoring and controlling the effects of their production processes and operations on the natural environment (Montabon et al., 2007).

Supplier refers to a party that provides materials, parts, services, and goods directly to a manufacturer (Chambers, and Johnston, 2010). Supplier integration can be define as "environmental collaboration between a firm and its suppliers in implementing environmental management practices" (Vachon and Klassen, 2008). It is a phase where upstream segment of company's supply chain and product are focused (Zhu and Cote, 2004). Suppliers should be involved in the implementation of environmental practices in terms of material management procedures and purchasing processes (Rao and Holt, 2005). The supplier's environmental performance is increasingly monitored by manufacturing organizations to ensure that the equipment or materials supplied have gone through environmental-friendly processes (Rao and Holt, 2005).

The main players in automobile industries like Toyota and Ford have required their suppliers to obtain ISO 14001 certifications in supporting the environmental initiatives (GEMI, 2001). This is due to the reason that suppliers are important partners as they can be in a position to provide assistance to improve environmental performance of the supply chain (Seuring and Muller, 2008). Collaboration with suppliers could improve sustainable performance of one organization economically and environmentally (Vachon and Klassen, 2006). Zhu et al. (2010) emphasized the significance of supplier integration and sustainable performance by stating that the lack of supplier collaboration would weaken sustainable performance improvements among manufacturing firms. Based on the literature reviews, these hypotheses have been proposed:

H1 Supplier integration positively influences environmental sustainability performance.

Customer is a party that receives or consumes products (goods or services) and has the ability to choose between different products and suppliers (Slack et al., 2010). The customer in supply chain scope includes merchandiser, retailer, wholesaler, online retailer, and consumers (Russell and Taylor, 2009). Integrating customer can be defined as "environmental collaboration between a focal firm and its customers that aims to fulfil customer environmental requirements" (Vachon and Klassen, 2008). It focuses on the downstream side of the supply chain. Customer integration covers the level of integration in adopting green supply chain management practices for environmental management, planning purposes, and to find solutions of environmental problems (Wu, 2013). Eltayeb et al. (2011)

emphasized on the importance of customer participation in increasing organization's environmental performance.

Zhu et al. (2010) managed to identify opportunities for firms in conducting environmental integration with their customers. One of these opportunities is by building great long term relationship with customers as it is a key to a successful implementation of environmental practices (Zhu et al., 2010; Green et al., 2012). Previous study by Christmann and Taylor (2001) has shown that the main driver for manufacturers to improve their environmental practices and image is customer pressure. Apart from that, understanding the needs of customer is an important aspect in creating value. Due to pressures from the customers, it is critical for firms to conduct environmental collaboration with them to develop joint environmental planning and achieve environmental goals collectively (Vachon and Klassen, 2008).

Green Brand Survey (2010) indicated that customers in developed countries like Australia, United States of America, and United Kingdom are willing to cooperate with manufacturers to achieve environmental goals and they prefer to purchase from environmentally responsible company (Chen et al., 2012). Finding from the study shows that green-oriented customers assess green attributes of a service or product via their purchases.

These phenomena may influence the organizational sustainable performance in term of economic, environmental, and social (Chen et al., 2012). It is also found that customer collaboration determines economic performance and competitive advantage of one business organization (Andic et al., 2012). Whenever a new product is introduced, customer involvement is always crucial as the product features related to green concept need to be presented and clearly defined by manufacturers (Chan et al., 2012).

Yeung et al. (2008) and Ellram et al. (2008) also emphasized that interaction between manufacturers and customers can improve organizational sustainable performance. Similarly, the literature about 'lean and green' from Simpson et al. (2007) stated that the level of customer's collaboration is positively related to environmental and social sustainable performance of firms. Thus, these hypotheses were further proposed:

H2 Customer integration positively influences environmental sustainability performance.

3.0 Methodology

The population of this research consists of all Malaysian manufacturing firms that are certified in MS ISO 14001. Based on Standards and Industrial Research Institute of Malaysia (SIRIM) and Federation of Malaysian Manufacturers (FMM) directory in August 2014, there were 722 ISO 14001 certified manufacturing companies in Malaysia. The sample size in this study was determined by using the table provided by Krejcie and Morgan (1970). Based on the table, 169 companies need to be selected as a sample in order to represent the overall population. Then, a sample of members was drawn using a simple random sampling procedure.

Each company selected as sample was represented by a personnel from management level who has been appointed as in dealing or taking care of EMS or ISO documentations in the company. ISO 14001 certified companies were chosen as they were recognized as manufacturing firms which actively involved in the implementation of environmental management practices and aware with the requirement of environmental standards. A set of structured questionnaire was developed based on literature review and a series of interview with practitioners.

This questionnaire was used to gather data and information in examining the relationship between supplier integration and environmental sustainable performance as well as to test the proposed hypotheses. The unit of analysis chosen was organization whereby the questionnaire was answered by the target respondents at managerial level. The questionnaire survey was divided into three sections; Section 1 was designed to capture information on the respondent's background, Section 2: supplier integration and customer integration, and Section 3: environmental sustainable performance. Interval scale ranging from 1 (low) to 5 (high) was used. The respondents were request to indicate the extent to which they agree with the level of supplier and customer integration in the organization (Section 2) and the extent to which they agree with the level of organization's environmental sustainable performance (Section 3).

The questionnaires were distributed to the respondents by online survey and postal delivery. A total of 130 questionnaires were returned however, only 107 respondents provide necessary data which is appropriate for data analysis. The data was screened and prepared for hypotheses testing. Factor analysis and reliability test were done to confirm the validity and reliability of the instrument used. From the factor analysis, it was found that the Kaiser-Meyer-Olkin (KMO) values for each variable are more than 0.6 and the Bartlett's Test of Sphericity are significant for each variable confirming the factorability of the dimensions. The alpha values of reliability analysis for each variable range from 0.926 to 0.964 which are more than 0.6 and above 0.9, this point out that the internal consistency among all items of dependent variables and independent variables can be considered as very good. Therefore it can be established that the instrument is valid and reliable.

4.0 Findings and Discussion

The Pearson correlation was used to examine the relationships between dependent and independent variables, to predict the strength of the relationship as well as the direction of the relationship. This test was mainly used to test the first and second hypotheses of this study. The multiple regressions had been implemented in order to determine the strongest predictor among the supplier integration and customer integration on environmental sustainability performance. Table 4.1 shows the demographic of the respondent.

Table 4.1 Distribution of Respondent Based on Age of the Company

| Company's Age | Frequency | Percent |
|--------------------|-----------|---------|
| Less than 3 years | 2 | 1.9 |
| 3-10 years | 11 | 10.3 |
| More than 10 years | 94 | 87.9 |
| Total | 107 | 100.0 |

Based on the information in Table 4.1, 87.9% of the respondents are from manufacturing firms aged more than 10 years. This indicated that most of the data for this study was provided by respondents from companies which have been operating more than 10 years which may have been through many experiences. The others are provided by manufacturing firms aged between 3-10 years (10.3%) and manufacturing firms that have been operating less than 3 years (1.9%).

Most of the respondents for the study are from multinational company (MNC) and local company where both ownership types share same percentage at 40.2% followed by Joint Venture (JV) at 9.3%, government-linked company (GLC) and foreign company at 3.7%, and private-limited company with 3%.

Table 4.2 Distribution of Respondent Based on Types of Ownership

| Types of Ownership | Frequency | Percent |
|--------------------|-----------|---------|
| MNC | 43 | 40.2 |
| GLC | 4 | 3.7 |
| Local Company | 43 | 40.2 |
| Joint Venture | 10 | 9.3 |
| Foreign Company | 4 | 3.7 |
| Private Limited | 3 | 2.8 |
| Total | 107 | 100.0 |

4.1 Hypothesis Testing

The correlation analysis was carried out to determine the type and the strength of relationship exists between the variables in the hypothesis. In order to achieve the first objective of the study, the Pearson's correlation was used to examine the relationship between Green Supply Chain Integration (supplier integration, customer integration) and environmental sustainability performance. One-tailed test was used since the statements of hypotheses stipulate the directions of the relationships are positive. Table 4.3 represents the result of Pearson's correlation analysis:

Table 4.3 Results of Pearson Correlation Analysis

| Variables (IV) | Environmental Sustainability Performance (DV) |
|----------------------|--|
| Supplier Integration | 0.454** |
| Customer Integration | 0.501** |

** Correlation is significant at the 0.01 level (1-tailed)

Based on the results in Table 4.3, the correlation analysis shows that both supplier integration and customer integration have positive correlations with environmental sustainability performance at significance level of 0.01. The results show that the coefficient of beta supplier integration and customer integration are 0.454 and 0.501 respectively. Based on Hair et al. (2008), when the coefficient scale is between ± 0.41 and ± 0.70 , the relationship strength is considered as moderate. Therefore, Hypothesis H1 and H2 are supported.

Multiple regression analysis was applied to identify the best predictor influencing the environmental sustainability performance among ISO 14001 certified manufacturing firms in Malaysia. The variables of supplier integration and customer integration were tested using multiple regressions to achieve the second objective of this study. If the value is below the significant level of $p < 0.05$, this means that the independent variable influences the dependent variable. In contrast, if the value is above the significant value, it indicates that there is no influence between the independent and dependent variables (Gliner et al., 2009). The regression result in Table 4.4 shows that supplier integration and customer integration together explained 31.7% of the variance in predicting environmental sustainability performance. The model proposed is significant at 0.00 level ($F=29.514$, $p=0.000$).

Table 4.4: Multiple Regression Result of Supplier and Customer Integration on Environmental Sustainability Performance

| IV | Un-std Beta | Std. Beta | T | Sig. | Tolerance | VIF |
|-------------------------|-------------|-----------|-------|-------|-----------|-------|
| (Constant) | 1.256 | | 3.812 | 0.000 | | |
| Supplier Integration | 0.246 | 0.250 | 2.960 | 0.004 | 0.756 | 1.322 |
| Customer Integration | 0.441 | 0.397 | 4.706 | 0.000 | 0.756 | 1.322 |
| R | 0.563 | | | | | |
| R ² | 0.317 | | | | | |
| Adjusted R ² | 0.307 | | | | | |
| F | 29.514 | | | | | |
| Sig. | .000 | | | | | |
| Durbin-Watson | 1.787 | | | | | |

Based on the results of correlation and regression analysis, the variables were verified to have statistical significant associations with environmental sustainability performance. Therefore, based on the findings it can be established that supplier integration and customer integration are strong predictors on environmental sustainability performance among MS ISO 14001 certified manufacturing firms in Malaysia.

5.0 Conclusion

Achieving sustainable performance is now becoming main objective for business firms globally. In depth, to ensure long-term sustainability in the market and to gain competitive advantage, the balance of economic, environmental, and social are required to be sustained as well. Environmental obligation has caused many business firms to comply with the regulations. The practice of the environmental management however requires integration among the supply chain partners to achieve environmental sustainability performance.

Supplier integration and environmental sustainability performance have been found to have significant positive relationship. The finding is parallel with Vachon and Klassen (2006), which emphasize that integration from supplier side will improved business organization' performance in terms of economic and environment. They added that information exchange

on strategies, goals, and performance standards related to environmental concerns with suppliers would benefit the manufacturer on their operation costs and green activities. The correlation analysis also showed that collaboration with suppliers among Malaysian ISO 14001 certified manufacturing firms in green supply chain practices positively influenced environmental sustainability performance. The same result had been shown in previous studies from Geffen and Rothenberg (2000) and Zhu et al. (2010) where it was found that coordinating green process with supplier lead to improvement of employees and community's health and safety.

Besides that, customer integration also was found to have significant influence on environmental sustainability performance. Based on the result of Pearson's correlation test, customer integration must be considered by manufacturing companies in their effort to face the environmental challenges and to reduce environmental impacts from products or services provided. The finding suggested that joint planning from customers could influence organization's cost reduction due to less environmental impacts. This is supported by Chan et al., (2012) which stated that knowledge and experience sharing between customer and manufacturer for environmental management can influence environmental sustainable performance. This finding also is parallel with prior study by Chen et al. (2012) which emphasize that the manufacturing firm's environmental sustainability performance was influenced by customer integration. Therefore it can be summarized that, the collaboration between supplier, customer and manufacturer will increase the achievements in environmental sustainability performance which will contribute to the creation of social welfare of employee, supplier, customer, and more importantly society (Simpson et al., 2007). The results enrich the knowledge on the relationship of supplier and customer integration and environmental sustainability performance.

6.0 References

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