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Research Paper

The impact of customer integration on manufacturing firms sustainable performance

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Abstract

This paper examined the impact of customers' integration on the three dimensions of sustainability performance (environmental, economic and social) among manufacturing firms. The rationale for undertaking this study is based on the fact that many manufacturing firms, most especially within Malaysia have yet to adopt green supply chain management (GSCM) concept in their business operation, with GSCM recently emerging to ensure that firms comply with regulations for environmental protection. Even the few firms that have implemented this concept do not integrate their customers in the chain, which has led to the creation of an unhealthy culture. Although there are few prior studies that have investigated customers' integration on manufacturing firms' sustainable performance, they have largely focused on sustainable performance only in terms of environmental dimension, excluding the economic and social dimensions. In this study, quantitative method was used for collecting data from 107 ISO14001 certified manufacturing companies in Malaysia. The statistical package for social science (SPSS) version 20.0 was used to analyze the data. The study findings indicate that customer integration has a positive and significant relationship with sustainable performance. Therefore, the study argues the need for customer integration to ensure a vibrant business organization performance.

Keywords: *Customer integration; Green management; Organizational performance; Supply chain; Sustainable performance.*

1. Introduction

Customer refers to a party that is the recipient of goods/services and is able to select different products as well as suppliers [1]. The customer in supply chain scope includes merchandiser, retailer, wholesaler, online retailer and consumers [2]. Integrating customer from green supply chain management (GSCM) perspective can be defined as environmental collaboration between a focal firm and its customers that aims to fulfill customer environmental requirements [3]. It focuses on the downstream side of the supply chain. Customer integration covers the level of integration in adopting GSCM practices for environmental management, planning purposes and to find solutions for environmental problems. However, most manufacturing firms especially within Malaysia have yet to adopt green supply chain management concept in their business operation [4] with the few firms that have implemented this concept failing to integrate their customers in the chain and thus creating an unhealthy culture

Although there are few prior studies [3, 5] that have investigated customers' integration on manufacturing firms sustainable performance such studies largely considered sustainable performance only in terms of environmental dimension, to the exclusion of both economic and social dimensions. This is particularly significant as there is identification of 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 [6]. Although studies have highlighted the importance of customer integration in GSCM particularly on environmental implications, they failed to capture the economic and social implications. Thus, it is needful to investigate the linkage of these three dimensions of firm's sustainability performance.

Hence, this paper examines the impact of customers' integration on the three dimensions of sustainability namely, environmental, economic and social performance among manufacturing firms.

2. Literature review

In order to fathom the impact of customers' integration with the three sustainability performance dimensions (environment, economy and society), among manufacturing firms, the present study conducts a review of the sustainability performance and their functions within manufacturing firms as related to manufacturing environmental issues.

2.1. The concept of sustainable performance

Business sustainable performance happens when a company or firm creates ongoing value for its stakeholders and shareholders while keeping up with environmental requirements [7]. There are few essential aspects of firm's sustainable value and they are; doing well for the environment and society and more importantly, keeping the customer and shareholders happy. Sustainability comprises of actions extending socially useful organization life, enhancing the maintenance and renewal of the biosphere and protecting living species, maintaining society and solving issues pertaining to the maintenance of welfare, participation and personal freedom of the present and future human generations [8].

There are three criteria of sustainable performance [9]: economic sustainable performance, environmental sustainable performance, as well as social sustainable performance. The European Commis-

sion published a sustainable development strategy in 2001 by emphasizing the importance of social cohesion, environmental protection and economic growth to go hand in hand [10]. In another vein, sustainable supply chain management is considered to be a novel management pattern that indicates the need to integrate economic, environmental and societal dimensions in all processes covering the procurement, production, packaging, transportation, storage, consumption and disposal of end-life product, reinforce by the technology used in the supply chain management and its objective to realize sustainable development of the three dimensions [11].

2.2. The Concept of Customer Integration

Customer refers to the recipient or the consumer of products, whether goods or services and they have the choice to select among different products and suppliers [1]. The customer in supply chain scope includes merchandiser, retailer, wholesaler, online retailer and consumers [2]. Integrating customer from GSCM perspective can be defined as environmental collaboration between a focal firm and its customers that aims to fulfill customer environmental requirements [3]. 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 for environmental problems [12].

By conducting environmental integration, firms can identify opportunities with their customers [5]. One of these opportunities is building great long term relationship with customers, as it is a key to a successful implementation of environmental practices [6, 13]. 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 [3].

2.3. Relationship of Customer Integration and Sustainable Performance

Previous study by [30] 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 companies. Findings from the study also shows positive correlation between customer integration and sustainable performance, where green-oriented customers assess green attributes of a service or product via their purchases. This situation affects organizational sustainable performance in terms of economic, environmental and social aspects [14].

It was also evidenced that customer collaboration determines economic performance and competitive advantage of a business organization [15]. A research by [16] reported a significant relationship between customer integration and environmental sustainable performance. 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 [17].

Previous studies [18-19] also emphasized that interaction between manufacturers and customers can improve organizational sustainable performance. Similarly, literature about 'lean and green' stated that the level of customer's collaboration is positively related to environmental and social sustainable performance of firms [20]. Thus, these hypotheses were proposed to be tested:

H: A positive relationship exists between customer integration and sustainable performance.

Ha: A positive relationship exists between customer integration and economic sustainable performance.

Hb: A positive relationship exists between customer integration and environmental sustainable performance.

Hc: A positive relationship exists between customer integration and social sustainable performance.

3. Methodology

The study was conducted using quantitative method involving hypotheses testing. Research hypotheses were constructed based on prior studies regarding the relationship between green supply chain integration and sustainable performance as stated in previous section. The study used simple random sampling by focusing on manufacturing firms that are ISO14001 certified in the context of Malaysia and thus such firms constituted the study sample. As of August 2014, the Standards and Industrial Research Institute of Malaysia (SIRIM) and Federation of Malaysian Manufacturers (FMM) directory listed 722 ISO 14001 certified manufacturing companies in the country. Data was obtained from two source types, primary and secondary sources where the former was gathered from the field survey and the latter from books, reports, seminar papers and journal articles. The researchers developed a survey to examine the relationship between Green Supply Chain Integration (GSCI) and Sustainable Performance among Malaysian manufacturing firms.

4. Results and discussion

A total of 500 questionnaire forms were delivered by mail to the manufacturing firms' address and an additional 100 questionnaire forms were mailed online. Both paper and electronic format questionnaire forms were targeted towards respondents in management level. In particular, the study focused on the personnel who are incharge or responsible for environmental management system or ISO documentations in the organization. Out of 600 questionnaire forms distributed by mail and online, the author retrieved a total of 107 questionnaires from respondents equaling to 17.8% response rate. Despite a considerably low response rate mainly due to lack of respondent's cooperation, budget limitation and time constraint, the expected sample size of the study was referred to [21].

When the population size equals 722 ISO14001 certified firms, the sample size of 88 is considered sufficient according to [29]. The more data collected is better as a higher sample size will improve the statistical power in the study [22].

Factor analysis was performed using principal component analysis, which is generally done to determine the factors of the construct as suggested by [23] and the results are summarized in Table 1.

Table 1: Result of factor analysis

Items	Component	
customer1	0.927	Eigenvalue: 3.462
customer2	0.961	Percentage of Variance (%): 86.543
customer3	0.960	KMO: 0.778
customer4	0.870	Bartlett's Test of Sphericity: 133.160
		Significance: 0.000
economic1	0.940	Eigenvalue: 4.103
economic2	0.933	Percentage of Variance (%): 82.058
economic3	0.955	KMO: 0.823
economic4	0.950	Bartlett's Test of Sphericity: 157.977
economic5	0.733	Significance: 0.000
environmental1	0.909	Eigenvalue: 5.142
environmental2	0.962	Percentage of Variance (%): 85.706
environmental3	0.881	KMO: 0.791
environmental4	0.917	Bartlett's Test of Sphericity: 246.986
environmental5	0.943	Significance: 0.000
environmental6	0.940	
social1	0.893	Eigenvalue: 4.214
social2	0.958	Percentage of Variance (%): 84.288
social3	0.918	KMO: 0.804
social4	0.929	Bartlett's Test of Sphericity: 168.591
social5	0.891	Significance: 0.000

As shown in Table 1, the factor's loadings of every variable are above 0.7 and can be considered as excellent [24]. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) value of customer integration is 0.778, economic sustainable performance is 0.823, environmental sustainable performance is 0.791 and

social sustainable performance with 0.804. These results exceed the recommended value [25] of 0.6 and Bartlett's Test of Sphericity also reaches statistical significance, supporting the factorability of the dimensions. The principle component analysis (PCA) also reveals the presence of components with eigenvalues exceeding 1 for all five variables respectively explaining percentage of variance for customer integration (86.543%) the dimension of economic explains 82.058%, whereas environmental sustainable performance explains a total of 85.706% and social sustainable performance with 84.288% of the variance. This indicates that all of the items used to measure the variables are sustained. Furthermore, reliability analysis was carried out where the Cronbach's alpha for each variable is summarized in Table 2.

Table 2: Cronbach's Alpha for each variable

Variable	Cronbach's Alpha
Customer Integration	0.947
Sustainable Performance	0.977
Economic sustainable performance	0.941
Environmental sustainable performance	0.964
Social sustainable performance	0.952

From the obtained results, sustainable performance had the highest rate with 0.977, with three of its dimensions obtaining the following rates; economic sustainable performance (0.941), environmental sustainable performance (0.964) and social sustainable performance (0.952). Based on the results obtained, the internal consistency among all items of dependent variables and independent variables are all above 0.9 which are considered as very good as suggested by [28].

In order to understand the type and the strength of relationship existing between the variables in the hypothesis, correlation analysis was carried out, the result of which is summarized in Table 3.

Table 3: Summary of correlation analysis

Variables	SP	Pearson Correlation		
		Eco	Env	Social
Customer Integration	0.577**	0.433**	0.501**	0.593**

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

In Table 3, the values indicate that customer integration has positive correlations with the three dimensions of sustainable performance (economic, environmental, and social) at the significance level of 0.01. The result also shows that the strength of the relationships is moderate based on [25] statement that the coefficient scale of ±0.41 and ±0.70 of the relationship strength is considered as moderate. Therefore, hypotheses Ha to Hc are supported as evidenced by the results summarized in Table 4.

Table 4: Summary of all hypotheses (N = 107)

Hypothesis	Hypothesis Statements	Remarks
H1	A positive relationship exists between customer integration and sustainable performance.	Supported
H1a	A positive relationship exists between customer integration and economic sustainable performance.	Supported
H1b	A positive relationship exists between customer integration and environmental sustainable performance.	Supported
H1c	A positive relationship exists between customer integration and social sustainable performance.	Supported

Referring to Tables 3 and 4, the results showed that all hypotheses H1, H1a, H1b and H1c are supported. It is found that customer integration also has positive relationship with sustainable performance. Based on the result of Pearson's correlation test, customer integration with manufacturer to tackle environmental challenges and to reduce environmental impacts from products or services provided is positively correlated to manufacturing firms' sustainable performance. From the dimension of economic sustainable performance, the result showed that customer's joint planning correlates to organization's cost reduction due to less environmental impacts which is parallel with prior study [14]. Correlation analysis also showed that customer integration is positively correlated with environmental sustainable performance. Knowledge and experience sharing between customer and manufacturer for environmental management have significant positive relationship with environmental sustainable performance [17]. Similarly, there is an emphasis on the importance of customer participation in increasing organization's environmental performance [16]. The manufacturing firm's social sustainable performance is also positively correlated with customer integration. In other words, the customer integration and achievements in creating social welfare of employee, customer and society are significantly correlated [20]. Hence, H, Ha, Hb and Hc are supported.

5. Conclusion

Customer integration and sustainable performance have been found to be positively significant, consistent with roles of customer integration on business organization performance in terms of economic and environmental dimensions [26]. These suggest that information exchange on strategies, goals, and performance standards related to environmental concerns with customers would benefit the manufacturer on their operation costs and green activities. The correlation analysis also showed that collaboration with manufacturing firms' customers among Malaysian ISO 14001 certified manufacturing firms in green supply chain practices is positively correlated with social sustainable performance. The same result had been found in previous studies-for instance, [5, 27] where the authors found that coordinating green process with customer led to improvement of employees and community's health and safety. Thus, achieving sustainable performance is now becoming a 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. While environmental obligation has caused many business firms to comply with the regulations, the practice of the GSCM still requires integration among green supply chain partners, especially the customers in order to achieve sustainable performance.

References

[1] Slack N, Chambers S & Johnston R (2010), *Operations management*, Pearson Education.

[2] Russell RS & Taylor-Iii BW (2008), *Operations management along the supply chain*, John Wiley and Sons.

[3] Vachon S & Klassen RD (2008), Environmental management and manufacturing performance: The role of collaboration in the supply chain. *International Journal of Production Economics* 111, 299–315.

[4] Wooi GC & Zailani S (2010), Green supply chain initiatives: Investigation on the barriers in the context of SMEs in Malaysia. *International Business Management* 4, 20–27.

[5] Zhu Q, Sarkis J & Lai KH (2012), Examining the effects of green supply chain management practices and their mediations on performance improvements. *International Journal of Production Research* 50, 1377–1394.

[6] Zhu Q, Geng Y & Lai KH (2010), Circular economy practices among Chinese manufacturers varying in environmental-oriented supply chain cooperation and the performance implications. *Journal of Environmental Management* 91, 1324–1331.

[7] Brent AC & Labuschagne C (2004), Sustainable Life Cycle Management: Indicators to assess the sustainability of engineering projects and technologies. *Proceedings of the IEEE International Engineering Management Conference*, pp. 99–103.

[8] Dunphy D (2011), Chapter 1-Conceptualizing sustainability: The business opportunity. In G. Eweje & M. Perry (Eds.), *Business and Sustainability: Concepts, Strategies and Changes (Critical Studies*

on Corporate Responsibility, Governance and Sustainability (Vol. 3). England: Emerald Group Publishing Limited, pp. 3–24.
[9] Chen Y, Okudan GE & Riley DR (2010), Sustainable performance criteria for construction method selection in concrete buildings. *Automation in Construction* 19, 235–244.
[10] Pei Y, Amekudzi A, Meyer M, Barrella E & Ross C (2010), Performance measurement frameworks and development of effective sustainable transport strategies and indicators. *Transportation Research Record: Journal of the Transportation Research Board* 21, 73–80.
[11] Guan YH, Cheng HF & Ye Y (2010), Performance evaluation of sustainable supply chain based on ahp and fuzzy comprehensive evaluation. *Applied Mechanics and Materials* 26, 1004–1007.
[12] Wu GC (2013), The influence of green supply chain integration and environmental uncertainty on green innovation in Taiwan's IT industry. *Supply Chain Management: An International Journal* 18, 539–552.
[13] Green Jr KW, Zelbst PJ, Meacham J & Bhadauria VS (2012), Green supply chain management practices: Impact on performance. *Supply Chain Management: An International Journal* 17, 290–305.
[14] Chen CC, Shih HS, Shyur HJ & Wu KS (2012), A business strategy selection of green supply chain management via an analytic network process. *Computers and Mathematics with Applications* 64, 2544–2557.
[15] Andiç E, Yurt Ö & Baltacıoğlu T (2012), Green supply chains: Efforts and potential applications for the Turkish market. *Resources, Conservation and Recycling* 58, 50–68.
[16] Eltayeb TK, Zailani S & Ramayah T (2011), Green supply chain initiatives among certified companies in Malaysia and environmental sustainability: Investigating the outcomes. *Resources, Conservation and Recycling* 55, 495–506.
[17] Chan HK, He H & Wang WY (2012), Green marketing and its impact on supply chain management in industrial markets. *Industrial Marketing Management* 41, 557–562.
[18] Yeung AH, Lo VH, Yeung AC & Cheng TE (2008), Specific customer knowledge and operational performance in apparel manufacturing. *International Journal of Production Economics* 114, 520–533.
[19] Ellram LM, Tate W & Carter CR (2008), Applying 3DCE to environmentally responsible manufacturing practices. *Journal of Cleaner Production* 16, 1620–1631.
[20] Simpson D, Power D & Samson D (2007), Greening the automotive supply chain: A relationship perspective. *International Journal of Operations and Production Management* 27, 28–48.
[21] Yamane T (1967), *Statistics: An introductory analysis*, Harper and Row.
[22] Martin P & Bateson P (1986), *Measuring behaviour: An introductory guide*, Cambridge University Press.
[23] Hair JF, Black WC, Babin BJ & Anderson RE (2010), *Multivariate data analysis*, Prentice Hall.
[24] Tabachnick BG & Fidell LS (2007), *Experimental designs using ANOVA*, Thomson/Brooks/Cole.
[25] Hair JFJ, Money AH, Samouel P & Page M (2008), *Research method for business*, John Wiley and Sons.
[26] Elmore PB & Beggs DL (1975), Salience of concepts and commitment to extreme judgments in the response patterns of teachers. *Education* 95, 325–334.
[27] Geffen C & Rothenberg S (2000), Sustainable development across firm boundaries: The critical role of suppliers in environmental innovation. *International Journal of Operations and Production Management* 20, 166–186.
[28] Sekaran U & Bougie R (2016), *Research methods for business: A skill building approach*, John Wiley and Sons.
[29] Krejcie RV & Morgan DW (1970), Determining sample size for research activities. *Educational and Psychological Measurement* 30, 607–610.
[30] Green Brands Survey (2010), *2010 green brands global media final*. https://www.slideshare.net/WPPGreenBrandsSurvey/2010-green-brands-global-media-final