Jurnal Pengurusan 52(2018) 19 – 32
https://doi.org/10.17576/pengurusan-2018-52-02

Green Supply Chain Management Practices and Organizational Performance: An Empirical Study in Malaysian Manufacturing Firms

(Amalan Pengurusan Rantaian Bekalan Hijau dan Prestasi Organisasi: Kajian Empirik di Firma Perkilangan Malaysia)

Cheng Ling Tan
(Graduate School of Business, Universiti Sains Malaysia)
Sook Fern Yeo
(Faculty of Business, Multimedia University)
Chea Huat Low
(Graduate School of Business, Universiti Sains Malaysia)

ABSTRACT

This study aims to examine the influence of green supply chain management practices (GSCMP) and manufacturing capabilities on organizational performances. A quantitative method was used with the data obtained from the sample of 103 large manufacturing firms listed in the Federation of Malaysia Manufacturers (FMM). Smart-PLS 3.0 software was employed to confirm the data validity and reliability, and test the structural path modeling. This implies that GSCMP with manufacturing capabilities as the mediator is important to foster the organizational performance among manufacturing firms. A total of 103 manufacturing companies in Malaysia participated in this study with a response rate of 18%. It shows that only eight sub-hypotheses out of thirteen sub-hypotheses were supported, and the remaining five sub-hypotheses were not supported. The conclusion of this study provides the theoretical and practical implications as well as suggestions for future studies in different industries such as service, tourism and information technology.

Keywords: Green supply chain management practices; organizational performances; manufacturing capabilities; Resource Based View Theory; Federation of Malaysia Manufacturers; Malaysia

ABSTRAK

Tujuan kajian ini adalah untuk mengkaji pengaruh amalan pengurusan rantaian bekalan hijau dan keupayaan perkilangan terhadap prestasi organisasi. Kaedah kuantitatif telah digunakan untuk dapatan data 103 sampel dari firma perkilangan yang tersenarai di Persekutuan Pekilang-pekilang Malaysia (FMM). Perisian Smart-PLS digunakan untuk manjalankan analisis statistik bagi memastikan kesahan dan kebolehpercayaan, dan juga menguji path modeling. Kajian ini melibatkan amalan pengurusan rantaian bekalan hijau dengan keupayaan pengeluaran sebagai mediator adalah penting terhadap prestasi organisasi di kalangan firma perkilangan. Sejumlah 103 firma perkilangan di Malaysia telah mengambil bahagian dalam penyelidikan tersebut dengan kadar tindak balas sebanyak 18%. Dapatan kajian menunjukkan bahawa terdapat lapan daripada tiga belas andaian yang disokong dan lima andaian yang tidak disokong. Kajian ini memberikan implikasi kepada teori dan praktikal serta boleh dicerakinkan untuk kajian masa depan di industri yang berlainan seperti perkhidmatan, perlancongan dan informasi teknologi.

Kata kunci: Amalan pengurusan rantaian bekalan hijau; prestasi organisasi; keupayaan pengeluaran; Resource Based View Theory; Persekutuan Pekilang-pekilang Malaysia; Malaysia

INTRODUCTION

The manufacturing sector has contributed to the Malaysian economy growth in 2016 with a GDP of 4.4% amounting to RM316.90 billion (Malaysia Productivity Corporation (MPC) 2017). However, the manufacturing sectors experienced declination in labor cost competitiveness in 2016 as indicated by the increase in both labor cost per employee and unit labor costs of 3.1% and 5% respectively in 2016 (MPC 2017). The growth of the labor cost of 3.1% had overtaken the productivity growth of 1.4% in the manufacturing sector and the rise in labor cost higher than the labor productivity was regarded as a threat to our nation's competitiveness (MPC 2017).

Given the uncertainties in the global market and the decline of labor cost competitiveness, it is therefore recommended that Malaysian manufacturers take proactive actions to manage their resources effectively and efficiently to sustain their competitive positions in the global market, and achieve improvement in scale efficiencies (Suzari & Jayaraman 2014). Manufacturers are advised to align their manufacturing strategies with the imminent business challenges, such as customer relationships, sustainability, and manufacturing performance (MPC 2013); and adopt the global trend for green productivity, such as minimizing waste and pollution, producing environment friendly, energy savings, and promoting use of renewables (Tan, Goh & Chan 2015a) to meet the standards for green

manufacturing. Considering the challenges faced by the Malaysian manufacturers and the advice from the MPC to the Malaysian manufacturers, it is, therefore, imperative for the Malaysian manufacturers to consider adopting the GSCMP to enhance manufacturing competitiveness.

In the recent years, GSCMP has been increasingly adopted by many manufacturing firms that aim to improve their organizational performance. Extensive studies have been conducted and confirmed the positive impact of GSCMP toward organizational performance (Green et al. 2012; Chan et al. 2012; Lee, Kim & Choi 2012). The rapid industrialization in Malaysia has produced a negative impact on the environment, such as hazardous waste, pollution, and the depletion of natural resources consumption which has become a major concern to the public (Eltayeb, Zailani & Ramayah 2011). What's more, GSCMP is relatively new in South East Asia, and recent studies have been focusing on China's manufacturing environment (Noor Aslinda et al. 2012). The researcher continues to state that in Malaysia, the concept of GSCM is relatively new, whereby the Malaysian manufacturers have a lower level of GSCMP adoption compared to multinational companies (MNC) (Eltayeb & Zailani 2009). Although there are studies on GSCMP in China which may have a similar market and social-cultural background, different sectors of the various countries may be experiencing the different pressure of adopting GSCMP and level of GSCMP implementation (Zhu & Sarkis 2004).

As manufacturing is regarded as the most important key factor that determines the competitiveness of the manufacturing companies, businesses that are competing in the market has therefore strive to maximize the manufacturing capabilities. Manufacturing capabilities has four general categories which are quality, flexibility, dependability and cost, of which are the key denominators in determining the organization's performance. In regards of the organizational performance, numerous studies have been conducted and confirmed the direct positive influence of GSCM practices toward organizational performance (Green et al 2012); the positive impact of GSCM practices implementation towards the achievement of the competitive advantage from the RBV perspectives (Shi et al. 2012), and concluded that the GSCM practices will lead to achievement of manufacturing capabilities (Vachon & Klassen 2008); and the direct effect of manufacturing capabilities towards the organizational performances (Avella & Vázquez-Bustelo 2010). However, none of the studies above have examined the role of the manufacturing capabilities as the mediator between the relationship of GSCM practices and organizational performances as a whole.

Hence, while this research attempts to examine the relationship of the GSCM practices and organizational performances, it also explores the possible role of the manufacturing capability as the mediator between GSCM practices and organizational performances.

LITERATURE REVIEW

RESOURCE BASED VIEW (RBV) THEORY

The theory employed in this study is Resource Based View (NRBV) theory (Hart 1995). Resource based view (RBV) theory emphasized that firms make use the ability of resources to achieve competitive advantage. In order to achieve that, the resource must be valuable, rare, inimitable and non-substitutable (Grant 1996; Barney 1991). The RBV suggests that the firm's internal resources and capabilities should be the foundation of which the firm's strategy is based upon as they are the primary sources of profit, and the competitive advantage is derived from these resources and capabilities (Grant 1996). The resources were defined as the input to the production process such as skills of individual employees, firm's internal strategy imperatives, capital equipment, finance and so on. Capabilities were defined as the capacity of a group of resources to perform the tasks or activities within the organization (Grant 1996).

GREEN SUPPLY CHAIN MANAGEMENT (GSCM) PRACTICES

Manufacturing organizations began adopting the GSCMP in light of customers' demand for environmentally friendly and sustainable products and services. This practice would require manufacturing organizations to work together with the customer or supplier to achieve the goals of the environmental sustainability. This, in turn, will lead to better environment performance, such as reduced waste and pollution, and the consumption of hazardous material, and eventually driving the organization to the path of profitability and improved market share as the reputation of the company increas (Green et al. 2012).

Four GSCM practices that have been studied extensively in different industries and countries were broadly researched by the previous scholars, namely eco-design (Azevedo, Carvalho & Machado 2011; Lee et al. 2012), supplier customers collaboration (Azevedo et al. 2011; Green et al. 2012; Lee et al. 2012), investment recovery (Green et al. 2012; Chan et al. 2012), and internal environmental management (Green et al. 2012; Lee et al. 2012). In this study, we proposed to focus on these four dimensions of GSCMP as the predictors for organizational performance.

GSCM PRACTICES AND ORGANIZATIONAL PERFORMANCES

Green et al. (2012) stated that GSCMP implementation leads to economic and environmental performances, and eventually positively impacts the organizational performance. Investment recovery has a direct influence on the environmental performance but not on the economic performance of the organization. Collaboration with the customer has a direct impact on environment performance and indirectly impacting economic performance via environmental performance. The survey result from the SME Korean electronic industry showed that the GSCMP do

not directly impact the business performance, but it is the result of the improved operational efficiency and relational efficiency after implementation of the GSCM that increased the business performance (Lee et al. 2012). The case studies by Azevedo et al. (2011) on Portuguese automotive supply chain revealed that the environmental concern of automakers extended to the suppliers (even further toward the second tier suppliers) causes high adoption rate of GSCM practices. The results of the case study showed that GSCMP, such as reverse logistic, minimizing waste, ISO 14001 and working with the customer to change product specification have the highest rate of adoption.

As of these GSCMP influence towards the organizational performances, the studies showed that minimizing waste, environmentally friendly packaging, collaboration with customers has a direct impact on the quality performance (Tan et al. 2016). Reverse logistic and collaboration with the customers, which are the commonly studied variables, have a positive influence toward organizational performance specifically customer satisfactory. In the case of foreign-invested enterprises in China, Chan et al. (2012) demonstrated that internal (corporate value and belief) and external (regulations and rules) forces environmental sustainability awareness, have a significant positive impact on organizational performances. With a focus on organizational performance, our hypotheses for the study are conjectured as below.

H_{1a} Internal environmental management has a positive effect on organizational performance.

H_{1b} Supplier customer collaboration has a positive effect on organizational performance.

H_{1c} Investment recovery has a positive effect on organizational performance.

H_{1d} Eco-design has a positive effect on organizational performance.

GSCM PRACTICES AND MANUFACTURING CAPABILITIES

From the Resource Based View, GSCM practices are perceived as an organization's internal causally ambiguous resources that will drive the organization to competitive advantage and organizational performance improvement (Shi et al. 2012). The manufacturing capabilities are a competitive advantage that the manufacturing organizations that seek to maximize the profitability. Research by Montabon, Sroufe and Narasimhan, (2007) suggested that GSCM practices imposed a positive impact on the manufacturing capabilities, such as product quality, cost, products and processes innovation (flexibility capability), and delivery capability performance. Yang et al. (2010) has proved that GSCM practices have a direct relationship on manufacturing capabilities. Sroufe (2003) has stated that a positive relationship exists between GSCM and manufacturing capabilities regarding cost, and quality. According to the research, waste reduction can help improving the manufacturing's cost capability, and by strengthening the product innovation, the quality capability can be elevated. Vachon and Klassen (2008) looked at the manufacturing capability from the collaboration with supplier and customer on environment objectives perspective and argued that collaboration between organizations is recognized as a competitive advantage, and not only it improves the environmental performance, but also manufacturing capabilities mainly in quality, flexibility, and delivery.

Internal Environment Management Internal environment management has a direct impact on the manufacturing capability of cost, quality, delivery and flexibility depending on the business strategy imperatives (Buyukozkan & Cifci 2012), and it is important that environmental practices shall align with the organization's business strategy (Testa & Iraldo 2010). Hence, this posits that once the organization embedded the environmental sustainability as the organization strategy imperatives, the competitive advantage of the manufacturing capabilities can be achieved.

H_{2a} Internal environment management has a positive effect on manufacturing capabilities.

Supplier Customer Collaboration Vachon and Klassen (2008) have argued that suppliers and customers collaborations on the environment objectives are a competitive advantage that will drive the organization to achieve manufacturing capabilities in quality, flexibility, and delivery. Li et al. (2006) echoed that collaboration with supplier influencing the flexibility capability (time to market) and in turn elevate the degree of customers' satisfaction. Collaboration with suppliers and customers involved integration/sharing of information which will lead to reliable delivery. Hence, this study predicts that the collaboration with supplier and customer will lead to improvement of the manufacturing capability in flexibility capability and delivery capability.

H_{2b} Supplier customer collaboration has a positive effect on manufacturing capabilities.

Inventory Recovery Inventory recovery involves the selling the excessive inventory and capital equipment, and also the scraps and used materials (Zhu & Sarkis 2004), it helps reduce the inventory cost and also free up more space for the organization for future upgrade and machine installment to support ad hoc customer demand. Therefore it is postulated that inventory recovery has a direct impact on manufacturing capability in cost capability and flexibility capability.

H_{2c} Inventory recovery has a positive effect on manufacturing capabilities.

Eco-Design Eco-design is a practice which manufactures minimize the consumption of materials and energy through the product design innovation that capable of reuse and recycles of the materials, and reduce the use of harmful products in the manufacturing processes (Zhu & Sarkis 2004), and the manufacturing cost capability is governed

by the reduction of consumption of raw material, the use of reusable and recyclable materials as the substitution of raw materials, and environmentally efficient manufacturing technologies (Jabbour et al. 2012), therefore it posits that the Eco Design has a positive effect on the manufacturing capability in cost capability.

H_{2d} Ec-design has a positive effect on manufacturing capabilities.

MANUFACTURING CAPABILITIES AND ORGANIZATIONAL PERFORMANCES

It is widely acknowledged that the manufacturing function in any business can help it to stay competitive in the market (Mohd. Nasurdin, Tan & Khor 2014). As such, manufacturing organizations aim to achieve the highest levels of performance, such as quality, cost, flexibility, and delivery. These manufacturing capabilities are being widely acknowledged as keys to the well-being of any manufacturing organization. Competitive priorities have been broadly divided into four basic dimensions in literature: cost, quality, delivery performance, and flexibility (Muzamil & Idris 2012). The research also revealed that different sectors place different level of emphasis on four major manufacturing capabilities. For example, fast food, hospital, retail stores place high focus on quality capability, whereas hotel, architect and auto repair prioritized delivery capability. The organization can achieve cost saving through quality capability from the result of an increase of economy of scale from market gains, less scrap, rework and product return rate, and lower customer service costs due to lower warranty claiming. Thus, quality capability will then result in better competitive advantage (Tan, Goh & Chan 2015b). Sarmiento et al. (2007) argued that delivery capability specifically, if committed by the organization to ensure due diligent delivery of products to their customer on time has direct positive effect on organization performances. Avella and Vázquez-Bustelo (2010) also proved that manufacturing capabilities significantly contributes to the organization's business performance when the manufacturing capabilit ies are aligned with the business strategies and consistent with market requirements.

H_3 Manufacturing capabilities has a positive effect on organizational performance.

MANUFACTURING CAPABILITY AS MEDIATOR

According to Preacher and Hayes (2008), mediation exists when the independent variable affects a dependent variable indirectly through at least one intervening variable, or mediator. Based on the direct effect studies discussed in the previous sections, GSCM practices have been validated by many researchers to have a positive effect on the manufacturing capabilities, such as quality, flexibility, cost and delivery capabilities (Montabon et al. 2007; Sroufe 2003; Vachon et al. 2008), and in turn these manufacturing capabilities would translate into organization performances (Sarmiento et al. 2007; Avella et al. 2010). The manufacturing capibilioty is postulated as the mediator in this study as the researchers believed that the factors (internal environment management, supplier-customer collaboration, inventory recovery and eco-design) can have an impact on the organizational performance via manufacturing capability. Thus, the hyphothesis are deveoped as follows,

H_{4a} Manufacturing capabilities mediates the relationship between internal environment management and organization financial performance.

H_{4b} Manufacturing capabilities mediates the relationship between supplier-customer collaboration and organization financial performance.

H_{4c} Manufacturing capabilities mediates the relationship between inventory recovery and organization financial performance.

H_{4d} Manufacturing capabilities mediates the relationship between eco-design and organization financial performance.

Figure 1 shows the research framework of the study and the hypotheses postulated.

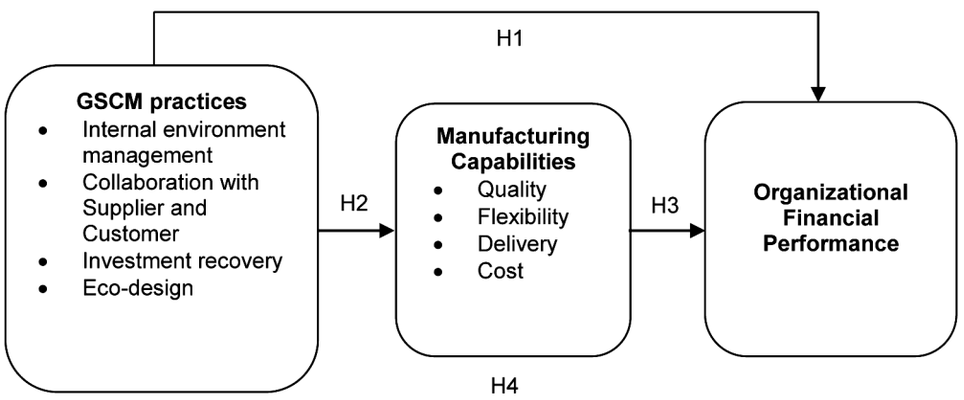

FIGURE 1. Research frameworks for investigation of relationship between GSCM practice and organizational performance in Malaysia large manufacturing corporates

RESEARCH METHODOLOGY

SAMPLE AND DATA COLLECTION PROCEDURE

The respondents of this study were from the large manufacturing companies listed under the Federation of Malaysian Manufacturer (FMM). According to the definition by FMM, the large manufacturer refers to those companies that consist of 150 employees and above. The population of this study consists of a total of 572 large manufacturing companies listed in FMM directory. The unit of analysis will be the large manufacturing companies listed under the Federation of Malaysian Manufacturer (FMM) which practices green supply chain management. The types of large manufacturing companies include public listed manufacturing firms, multinational cooperation, and others joint venture cooperation. A cover letter describing the purpose of this study along a filtering question has been included in the quesionaire to filter the company that practices green supply chain management to be selected as the respondent for this study. The targeted representative from the companies is assumed to hold the position of Managing Director, Supply Chain Manager, Plant Manager, and Product Manager, who would understand the GSCMP, and organizational performance. This study employed the census approach to mail the questionnaires to all PHEIs (452) listed in Malaysia. Census method was used because of the small sampling frame available for this study and the likelihood of obtaining low response rate from mailed survey (Sekaran & Bougie 2010) where questionnaires are distributed to the correspondence of the 572 large manufacturers. Mail questionnaire method was employed in this study because of its advantage of covering wide geographically.

MEASURE AND ANALYSIS

The questionnaire used in this study was adopted from previous research. The independent variables in the study related to four GSCMP (eco-design, internal environment management, collaboration with supplier and customers, and investment recovery) comprising of 17 items were adapted from Zhu and Sarkis (2004). Whereas the measurements of the manufacturing capabilities which comprised of 15 items were adapted from Avella and Vázquez-Bustelo (2010), and five point Likert scale was deployed to gauge the level of agreement or disagreement on each element in the measurement. Meanwhile, organizational performance (financial performance) were measured using four items procured from Soo (2006). Respondents responded to the items using a 5-point Likert scale with 1 ”=”strongly disagree” to 5 “strongly disagree”. Table 1 postulates the measurement items used in this research.

TABLE 1. Measurement items of the study

Factors	Variables	Items
Organizational Performance		Organization’s market share has increased. Organization’s return on investment has increased. Organization’s market share is growing. Organization’s sale is growing.
GSCM practices	Internal Environment Management	Commitment of GSCM from senior managers. Support for GSCM from mid-level managers. ISO14001 certification. Environment management system exist. Cross-functional cooperation for environmental improvements. Environmental compliance and auditing programs.
	Collaboration with supplier and customers	Cooperation with suppliers for environmental objectives. Providing design specification to suppliers that include environmental requirements for purchased item. Cooperation with customers for cleaner production Cooperation with customers for green packaging. Cooperation with customer for eco-design.
	Investment recovery	Investment recovery (sale) of excess inventories/materials. Sale of scrap and used materials. Sale of excess capital equipment.
	Eco-Design	Design of products for reduced consumption of raw material/ energy. Design of products for reuse, recycle, recovery of material, component parts. Design of products to avoid or reduce use of hazardous of products and/or their manufacturing process.

Continue

TABLE 1. *Continued*

Factors	Variables	Items
Manufacturing capabilities	Quality	Improve conformance to design specifications. Offer consistent and reliable quality. Provide high-performance products. Manufacture with consistently low defect rates (reduce defect rates).
	Flexibility	Make rapid design changes. Introduce new product quickly. Offer a broad product variety Make rapid volume changes
	Delivery	Provide fast deliveries. Meet delivery promises and commitments. Reduce manufacturing lead time.
	Cost	Reduce manufacturing cost. Increase labour productivity. Reduce inventory level. Increase equipment or capacity utilization.

Structural Equation Modeling (SEM) technique was employed to test the hypotheses for this study. Smart-PLS Version 3 analysis tool was used in analyzing the data. The SEM technique is a second generation technique which is widely used nowadays to overcome the limitations associated with first-generation techniques, such as regression. The SEM technique allows researchers to include unobservable variables measured by indicators. The PLS-SEM technique involves separate assessment of the measurement model, and the structural model (Hair, Ringle & Sarstedt (2011). The evaluation of measurement model aims to assess the model's reliability and validity; whereas the evaluation of the structural model aims at evaluating the significance of the proposed relationships and as well as the amount of variance explained.

RESULTS

DATA ANALYSIS

A total of 572 questionnaires were distributed to manufacturing companies in the first week of October 2013. A two month period was given to these responding manufacturing companies to complete the questionnaires. However, after the stipulated period, 109 questionnaires were returned. Six out of 109 questionnaires were found unusable due to incomplete information. No more questionnaires were received after the deadline. Hence, the response rate was recorded as 18%.

SAMPLE PROFILE

Majority of the participating manufacturing companies are from Penang (41%), followed by Selangor (27.2%), and Johor (7.8%). As for the type of the organization, there are 42.7% multinational company, 22.3% Public listed, 20.4% Private Company and 14.6% others. 40.8% of the participated companies are from the electric and electronic industry, followed by 9.7% of pharmaceutical and medical equipment industry, and 7.8% of packaging, labeling and printing and food and beverage industries. In terms of organization ownership, 42.7% of the participated companies are 100% foreign owned and followed by 22% of 100% locally owned company and 16.5% joint ventures. Summary of the participating companies' profile is presented in Table 2.

TABLE 2. Profile of participated companies

		Frequency	%
Location	Johor	18	17.5
	Kedah	1	0.97
	Kuala Lumpur	1	0.97
	Melaka	3	2.9
	N.Sembilan	2	1.9
	Pahang	1	0.97
	Penang	42	40.8
	Perak	7	6.8
	Selangor	28	27.2
Organization	Multinational Company	44	42.7
	Public Listed	23	22.3
	Private	21	20.4
	Others	15	14.6
Ownership	100% Foreign owned company	44	42.7
	100% local owned company	42	40.8
	Joint venture	17	16.5
Industry	Automotive & component products	5	4.9
	Building materials & related products	5	4.9
	Chemicals & adhesive products	5	4.9

Continue

TABLE 2. *Continued*

		Frequency	%
	Electrical & Electronics products	42	40.8
	Food and beverage product	8	7.8
	Giftware & jewelry	2	1.9
	Iron, Steel product	3	2.9
	Industrial & Engineering products	5	4.9
	Packaging, Labeling & Printing	8	7.8
	Pharmaceutical, Medical equipment products	10	9.7
	Plastic products & resins products	7	6.8
	Textiles & Wearing products	3	2.9

MEASUREMENT MODEL RESULTS

The construct validity and reliability is used as the main criteria to assess the goodness of measurement model in this study. Reliability is a consistency test of the measurement models measures over a repetitive measurement, while validity concerns how well a measurement model capable of measuring the particular theory or concept (Sekaran & Bougie 2010). Convergent and discriminant validity determines the construct validity in this study.

Convergent validity refers to the degree of which multiple construct indicators which are theoretically related are in agreement. Factor loadings, composite reliability (CR), and average variance extracted (AVE) were used to assess the convergence validity (Hair et al. 2011). As the loadings of all construct indicators shall exceed the value of 0.5 (Hair et al. 2011), CC3 and IEM3 with factor loadings of 0.486 and 0.075 respectively were removed due to its loading was below the recommended value. Composite reliability is used in PLS-SEM analysis instead of Cronbach's Alpha to assess the consistency of the measurement items employed in this study. The composite reliability (CR) values indicate the extents of the representation of the construct indicators on the latent variables, ranged from 0.820 to 0.928 exceeded the recommended value of 0.7 (Hair et al. 2011). The AVE measures the variance captured by the construct indicators about the measurement error, ranged from 0.519 to 0.812, of which is greater than 0.50 (Hair et al. 2011). In this study manufacturing capabilities is the second-order constructs. Our results provide evidence that the measurement model is reliable and has adequate convergent validity (Table 3).

TABLE 3. Measurement model

First-order constructs	Second-order constructs	Question Items	Loadings	AVE	CR
Eco design		ED1	0.763	0.812	0.928
		ED2	0.954		
		ED3	0.972		
Internal environment management		IEM1	0.743	0.519	0.843
		IEM2	0.686		
		IEM4	0.702		
		IEM5	0.780		
		IEM6	0.687		
Inventory recovery		IR1	0.755	0.603	0.820
		IR2	0.838		
		IR3	0.733		
Supplier customer		SCC1	0.811	0.576	0.872
		SCC2	0.758		
		SCC3	0.781		
		SCC4	0.687		
		SCC5	0.754		
Cost capability		CC1	0.965	0.726	0.883
		CC2	0.974		
		CC4	0.546		
Delivery capability		DC1	0.915	0.760	0.905
		DC2	0.898		
		DC3	0.798		
Flexibility capability		FC1	0.716	0.613	0.863
		FC2	0.791		
		FC3	0.842		
		FC4	0.778		

Continue

TABLE 3. *Continued*

First-order constructs	Second-order constructs	Question Items	Loadings	AVE	CR
Quality capability		QC1	0.641	0.627	0.869
		QC2	0.912		
		QC3	0.793		
		QC4	0.798		
	Manufacturing capabilities	Cost capability	0.829	0.627	0.869
		Delivery capability	0.643		
		Flexibility capability	0.858		
		Quality capability	0.820		
Organizational Performance		OP1	0.890	0.785	0.916
		OP2	0.854		
		OP3	0.913		

CR = Composite Reliability, AVE = Average Variance Extracted.

Discriminant validity is defined as a situation when two or more distinctively different concepts are not correlated to one another (Sekaran & Bougie 2011). The discriminant validity of the measures was determined by utilizing Fornell-Lacker Criterion method. According to this criterion, the discriminant validity is confirmed when the square root of the AVE of each construct is higher than the correlations among the latent constructs. As shown in Table 4, the square root of the AVE of each construct is higher than the correlation of each construct, indicates the discriminant validity is well established.

TABLE 4. Discriminant validity of constructs

	CC	DC	ED	FC	IEM	IR	MC	OP	QC	SCC
CC	**0.852**									
DC	0.399	**0.872**								
ED	0.455	0.172	**0.901**							
FC	0.640	0.405	0.402	**0.783**						
IEM	0.394	0.416	0.555	0.457	**0.720**					
IR	0.458	0.291	0.411	0.503	0.628	**0.777**				
MC	0.829	0.643	0.459	0.858	0.568	0.522	**0.647**			
OP	0.396	0.059	0.377	0.392	0.253	0.142	0.331	**0.886**		
QC	0.554	0.391	0.363	0.596	0.515	0.359	0.820	0.140	**0.792**	
SCC	0.110	0.187	0.573	0.374	0.595	0.397	0.311	0.299	0.262	**0.759**

Diagonals (in bold) represent the squared roof of average variance extracted (AVE) while the others entries represent the correlations.
CC = Cost Capability, DC = Delivery Capability, ED = Eco-Design, Flexibility Capability, IEM = Internal Environment Management, IR = Inventory Recovery, MC = Manufacturing Capability, OP = Organizational Performance, QC = Quality Capability, SCC = Supplier Customer Collaboration.

From Table 5, all items loaded highly on its respective construct and low on another construct which provides sufficient support for the convergent validity at item level as suggested by Chin (1998).

STRUCTURAL MODEL RESULTS

After computing the path estimates in the structural model by bootstrap analysis, the statistical significance of the path coefficients was determined. According to Hair et al. (2013), although 5000 resamples are recommended, the authors also stated that the number of bootstrap samples should be high and exceeded the number of valid observations in the data. Therefore, the bootstrapping procedure for this study was done with 5000 resamples employed to produce path coefficient and their corresponding t-values.

Table 6 shows the direct relationships of the independent variables to the mediating variable, the direct relationship of the mediating variable to the dependent variable as well as the indirect relationships. As shown in Table 6, three out of four direct relationships were showing a significant positive relationship with manufacturing capabilities, namely internal environement management ($\beta = 0.333$, $p < 0.05$), inventory recovery ($\beta = 0.271$, $p < 0.01$) and eco-deign ($\beta = 0.257$, $p < 0.01$). Besides, there are three out of five direct relationships were showing a significant positive relationship with organizational performance, namely supplier-customer collaboration ($\beta = 0.164$, $p < 0.05$), eco-design ($\beta = 0.232$, $p < 0.05$)

TABLE 5. Cross loadings

	CC	DC	ED	FC	IEM	IR	QC	OP	SCC
CC1	**0.965**	0.486	0.364	0.652	0.415	0.437	0.572	0.261	0.074
CC2	**0.974**	0.337	0.434	0.639	0.351	0.400	0.567	0.373	0.042
CC4	**0.546**	0.086	0.462	0.228	0.208	0.376	0.145	0.551	0.296
DC1	0.417	**0.915**	0.188	0.519	0.370	0.274	0.453	0.012	0.139
DC2	0.302	**0.898**	0.141	0.263	0.348	0.209	0.391	0.083	0.199
DC3	0.306	**0.798**	0.101	0.200	0.387	0.292	0.093	0.079	0.162
ED1	0.160	0.106	**0.763**	0.161	0.380	0.085	0.209	0.262	0.484
ED2	0.455	0.121	**0.954**	0.354	0.554	0.433	0.381	0.322	0.513
ED3	0.519	0.214	**0.972**	0.487	0.542	0.481	0.358	0.411	0.561
FC1	0.251	0.257	0.402	**0.716**	0.381	0.287	0.373	0.293	0.470
FC2	0.431	0.275	0.454	**0.791**	0.462	0.501	0.343	0.379	0.542
FC3	0.691	0.344	0.410	**0.842**	0.387	0.472	0.593	0.243	0.242
FC4	0.546	0.374	0.029	**0.778**	0.227	0.305	0.512	0.334	0.013
IEM1	0.234	0.282	0.461	0.439	**0.743**	0.479	0.425	0.276	0.577
IEM2	0.174	0.285	0.434	0.334	**0.686**	0.454	0.346	0.255	0.592
IEM4	0.364	0.375	0.427	0.290	**0.702**	0.368	0.415	0.063	0.289
IEM5	0.460	0.290	0.437	0.319	**0.780**	0.500	0.363	0.202	0.321
IEM6	0.109	0.269	0.122	0.204	**0.687**	0.469	0.263	0.044	0.318
IR1	0.412	0.109	0.410	0.377	0.493	**0.755**	0.167	0.171	0.447
IR2	0.396	0.349	0.346	0.478	0.568	**0.838**	0.459	0.034	0.175
IR3	0.225	0.171	0.167	0.272	0.359	**0.733**	0.117	0.174	0.381
QC1	0.304	0.364	0.339	0.198	0.517	0.472	**0.641**	-0.147	0.294
QC2	0.596	0.420	0.294	0.589	0.540	0.419	**0.912**	0.127	0.183
QC3	0.463	0.291	0.223	0.544	0.201	0.128	**0.793**	0.182	0.087
QC4	0.333	0.154	0.329	0.481	0.402	0.145	**0.798**	0.224	0.324
OP1	0.286	-0.037	0.302	0.267	0.327	0.135	0.107	**0.890**	0.319
OP2	0.424	0.108	0.323	0.415	0.073	0.006	0.141	**0.854**	0.172
OP3	0.320	0.066	0.373	0.337	0.306	0.256	0.119	**0.913**	0.323
SCC1	0.157	0.149	0.463	0.366	0.404	0.420	0.083	0.267	**0.811**
SCC2	0.168	0.085	0.553	0.268	0.473	0.289	0.176	0.184	**0.758**
SCC3	-0.061	0.024	0.306	0.118	0.339	0.304	-0.007	0.122	**0.781**
SCC4	0.023	0.114	0.376	0.267	0.515	0.305	0.250	0.189	**0.687**
SCC5	0.036	0.230	0.397	0.278	0.460	0.197	0.340	0.278	**0.754**

and manufacturing capabilities ($\beta = 0.292$, $p < 0.01$). On the other hand, in examining the indirect effects, manufacturing capabilities was found to be a significant mediator to the relationships between eco-design and organizational performance ($\beta = 0.075$, $t = 1.998$, $p < 0.05$) and inventory recovery and organizational performance ($\beta = 0.079$, $t = 1.715$, $p < 0.05$).

THE IMPORTANCE-PERFORMANCE MATRIX ANALYSIS (IPMA) RESULTS

Importance-performance matrix analysis (IPMA) in this study extends the structural model analysis by performing IPMA to identify the possible areas that need to be addressed and improved with management activities. Specifically, by assessing IPMA, the impact of latent variables with a relatively high importance and relatively low performance on a particular endogenous latent variable would be identified (Hock, Ringle & Sarstedt 2010). Subsequently, IPMA results provide managerial insights to address and improve the identified areas with high importance and low performance (Schloderer, Sarstedt & Ringle 2014).

The analysis of IPMA was performed in SmartPLS and the results are illustrated in Table 7. The importance value is the direct effect of an exogenous variable on an endogenous variable, whereas the performance value is the latent variable score on a scale from 0 to 100. Figures 2 and 3 visualize the IPMA results for the two endogenous variables of 'manufacturing capabilities' and 'organizational performance.' It is evident from the importance-performance matrix analysis that for both endogenous variables namely; manufacturing capabilities and organizational performance, the highest performance

TABLE 6. Results of the hypothesis testing

Effects	Hypothesis	Path	Beta Value	Standard Error (STERR)	t – Value	Decision
Direct	H1a	IEM -> OP	-0.045	0.142	0.316	Not supported
	H1b	SCC -> OP	0.164	0.098	1.679*	Supported
	H1c	IR -> OP	-0.143	0.128	1.113	Not supported
	H1d	ED -> OP	0.232	0.122	1.907*	Supported
	H2a	IEM -> MC	0.333	0.182	1.831*	Supported
	H2b	SCC -> MC	-0.161	0.110	1.465	Not supported
	H2c	IR -> MC	0.271	0.096	2.825**	Supported
	H2d	ED -> MC	0.257	0.078	3.298**	Supported
	H3	MC -> OP	0.292	0.111	2.625**	Supported
Indirect	H4a	ED->MC->OP	0.075	0.038	1.998*	Supported
	H4b	IEM->MC->OP	0.097	0.067	1.447	Not supported
	H4c	IR->MC->OP	0.079	0.046	1.715*	Supported
	H4d	SCC->MC->OP	-0.047	0.045	1.058	Not supported

**p < 0.01, *p < 0.05, Bootstrapping (n = 5000)
CC = Cost Capability, DC = Delivery Capability, ED = Eco Design, FC = Flexibility Capability, OP = Organizational Performance, IEM = Internal Environment Management, IR = Inventory Recovery, QC = Quality Capability, SCC = Supplier Customer Collaboration.

belong to eco-design and the lowest performance is inventory recovery. However, the variables of the highest importance for manufacturing capabilities and organizational performance is internal environment management and eco-design respectively. Despite being the second most important factor, inventory recovery has the lowest performance among the other factors for manufacturing capabilities. On the hand, inventory recovery is the least important factor and the lowest regarding performance for organizational performance. Likewise, supplier customer collaboration is the second most important factor in relation to organizational performance. The results from IPMA analysis explains the areas which need improvements are supplier-customer collaboration, internal environment management and inventory recovery.

TABLE 7. Importance-performance matrix analysis (IPMA) results

Latent variable	Manufacturing capabilities		Organizational Performance	
	Direct effect (importance)	Index value (performance)	Direct effect (importance)	Index value (performance)
Eco-Design	0.208	76.301	0.307	76.301
Internal Environment Management	0.269	53.403	0.053	53.403
Inventory Recovery	0.219	49.653	-0.063	49.653
Supplier Customer Collaboration	-0.130	54.525	0.117	54.525

DISCUSSION AND LIMITATIONS

The aim of this study was to investigate the influence of four specific GSCMP (eco-design, inventory recovery, internal environmental management, and supplier customer collaboration) mediated by manufacturing capabilities (cost capability, flexibility capability, delivery capability and quality capability) on the organizational performance. The study found that internal environment management ($t = 1.831$, $p < 0.05$), inventory recovery ($t = 2.825$, $p < 0.01$) and eco-deign ($t = 3.298$, $p < 0.01$) had significantly and positively on manufacturing capabilities, whereas supplier-customer collaboration ($t = 1.465$) had no significant with manufacturing capabilities. Besides that, the findings also show that supplier-customer collaboration ($t = 1.679$, $p < 0.05$) and eco-design ($t = 1.907$, $p < 0.05$) had significantly and positively on organizational performance, but internal environment management ($t = 0.316$) and inventory recovery ($t = 1.113$) had no significant with organizational performance.

In many GSCM literature, GSCM practices have been linked directly to organizational performances. The findings

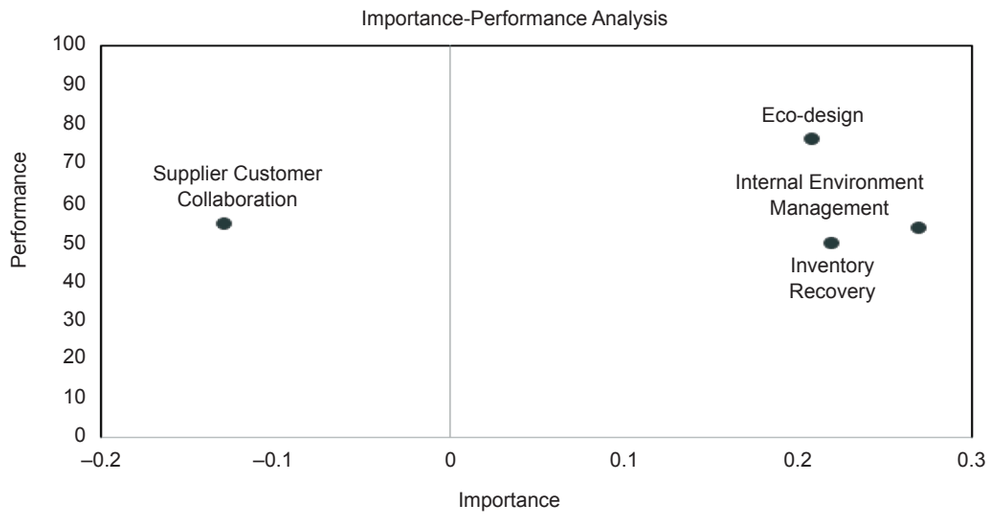

FIGURE 2. IPMA for manufacturing capabilities

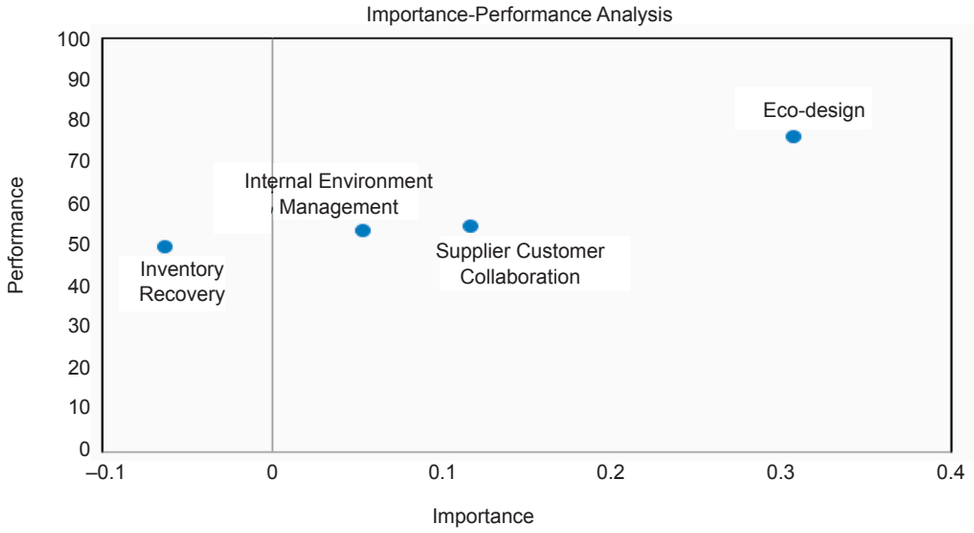

FIGURE 3. IPMA for organizational performance

of this research, however, have indicated the presence of the mediating effect of manufacturing capabilities between GSCM practice and organizational performances. The results revealed that the greater of eco-design implementation, the greater the organizational performance. Eco-design integrates the environment considerations into the product over its entire lifecycle during the product development and process. Consequently, when the consumption of materials and energy can be minimized during the product design stage, and the capable of reuse and recycle of the materials are increased, which in turn, the cost can be reduced, and the organizational performance will be increased. Our findings concur with previous research, such as Eltayab et al. (2011), and Zhu and Sarkis (2004). On the other hand, supplier customer collaboration and eco-design were found to be insignificant to the organizational performance. This could be possible that the effect of supplier-customer collaboration and eco-design do not directly involve the product, but more on the overall company management system, which may not necessary immediately translated into organizational performance in the short run (Eltayab et al. 2011). Internal environment management activities contributed to the success of the implementation of the green strategy. Once the organization embedded the green and environmental sustainability as the organization strategy imperatives, a favorable organizational performance can be achieved (Rodriguez 2009). In the similar vein, inventory recovery involves selling the excessive inventory and capital equipment, and also the scrap and used materials (Zhu & Sarkis 2004). Most of the manufacturing firms treat this practice as part of the environmental responsibility but do not mean for financial return.

Furthermore, in this study shows that manufacturing capabilities have a positive effect on organization performances. The result is consistent with the study conducted by Camisón and Ana (2010) and Li et al. (2006). Flexibility capability which is a construct under manufacturing allows the manufacturing to introduce the product to the market quickly to capture the market, and reduce the response time of the product volume changes, of which translates to better sales and profitability. It is showed that GSCM practices have a greater influence on the manufacturing capabilities than the organizational performances. The result also showed that manufacturing capabilities are more influential than GSCM practices on organizational performances. This indicates that GSCM practices would induce manufacturing capabilities as the competitive advantages to the manufacturing organizations in the first place, and in turn, the competitive advantages lead to improved organizational performance.

The results from IPMA analysis explains supplier-customer collaboration, internal environment management and inventory recovery are of least importance and lower in terms of performance. Correspondingly to the the above mentioned, we can see that the cooperations between the companies and their suppliers and customers are basically focusing on the cost effectiveness and cost leadership rather than committing on the environmental objectives and green actitivies. Besides, most companies are practicing the environmental management system is to comply to the regulations and to dispose the by-product and waste to ensure effectiveness than by looking at their main products at improving operation performance and manufacturing capability. Similarly, most manufacturing firms are adopting the lean and JIT concept whereby invenroty recovery may not be as significant. This is because they don't produce excess inventory and this would lead to lesser scrap materials, used materials and capital equipment which in turn not related to operation performace.

The study has demonstrated that the internal environment management, eco-design and inventory recovery have a direct relationship with manufacturing capabilities and thus highlighted the importance of these practices to the manufacturing organization. The result revealed there are specific dimensions of the GSCM practices that have a direct impact on the manufacturing capabilities. The managers shall identify and implement the GSMC practices to influence the specific manufacturing capabilities accordingly. For example, as per results revealed, inventory recovery and eco-design have a direct influence on the manufacturer's cost capability, hence should the managers want to specifically improve the cost capability via the implementation of the GSCM, it is, therefore, investment recovery and eco-design that should be implemented, and not the other GSCM practices.

The findings of this study offer a practical proposal to the manufacturing firms in Malaysia. Managers and senior managers from the manufacturing firms can be benefited from this result on improving the organization performances through the identification of the GSCMP that is relevant to the manufacturing strategies to achieve the organization performances. Furthermore, managers shall identify and implement the GSMC practices in order to influence the specific manufacturing capabilities accordingly. From the manufacturing capabilities perspective, managers of the manufacturers in Malaysia will strive to achieve competitive advantage in the importance factors that are keys for the market competitiveness. Besides, the theoretical relationship of the research framework in this study is empirically supported. The study tests and supports the relationship between GSCM practices, manufacturing capabilities and organizational performance. The finding of this study is aligned with the resource-based theory that was used to construct the framework of the study. Resource-based theory (Barney 1991) argued that as the firm possesses the resources (GSCM practices) would result in achieving competitive advantages (manufacturing capabilities), and therefore lead to organizational performances.

No doubt the results are interesting and noteworthy, it still needs to be thoughtfully viewed with several limitations in this study. The findings may not be used to generalize and apply to the manufacturing industry in Malaysia due to the sample size. Therefore, it is recommended to widen the coverage to include different industries such as service, tourism and information technology industries. Futhermore, the number of manufacturing companies practicing green supply chain management is limited. Apart from that, it is important to consider multiple organization performance measures such as environmental performance and social performances in the future research. It is possible that other factors may result in an organization's operation performance improvement. For example, should the company practice Just-In-Time (JIT), it is feasible to reduce the wastage, and indirectly eliminates the environmental waste. Hence, it is recommended to consider Total Quality Management (TQM), lean manufacturing and JIT as improvement programs antecedents to GSCM practices in the future study.

REFERENCES

Avella, L. & Va´zquez-Bustelo, D. 2010. The multidimensional nature of production competence and additional evidence of its impact on business performance. *International Journal of Operations & Production Management* 30(6): 548-583.

Azevedo, S.G., Carvalho, H. & Machado, V.C. 2011. The influence of green practices on supply chain performance: A case study approach. *Transportation Research Part E: Logistics and Transportation Review* 47(6): 850-871.

Barney, J. 1991. Firm resources and sustained competitive advantage. *Journal of Management* 17(1): 99-120.

Bosilj-Vuköic, V. & Indihar-gtemberger, M. 2008. The impact of business process orientation on financial and non-financial performance. *Business Process Management Journal* 14(5): 738-754.

Buyukozkan, G. & Cifci, G. 2012. Evaluation of green supply chain management practices: A fuzzy ANP approach. *Production Planning & Control* 23(6): 405-418.

Camisón, C. & Ana, V.L. 2010. An examination of the relationship between manufacturing flexibility and firm performance. *International Journal of Operations & Production Management* 30(8): 853-878.

Chan, R.Y.K., He, H., Chan, H.K. & Wang, W.Y.C. 2012. Environmental orientation and corporate performance: The mediation mechanism of green supply chain management and moderating effect of competitive intensity. *Industrial Marketing Management* 41(4): 621-630.

Camisón, C. & Ana, V.L. 2010. An examination of the relationship between manufacturing flexibility and firm performance. *International Journal of Operations & Production Management* 30(8): 853-878.

Efthalia, D., Dimitris, S., Kostas, T. & Stavros, G. 2004. Strategic orientation and financial performance of firms implementing ISO 9000. *International Journal of Quality & Reliability Management* 21(1): 72-89.

Eltayeb, T.K. & Zailani, S. 2009. Going green through green supply chain initiatives towards environmental sustainability. *Operations and Supply Chain Management* 2(2): 93-110.

Eltayeb, T.K., Zailani, S. & Ramayah, T. 2011. Green supply chain initiatives among certified companies in malaysia and environmental sustainability: Investigating the outcomes. *Resource, Conservation and Recycling* 55(5): 495-506.

Grant, R.M. 1996. Toward a knowledge-based theory of the firm. *Strategic Management Journal* 17 (special issue): 109-122.

Green, K.W., Zelbst, P.J., Meacham, J. & Bhadauria, V.S. 2012. Green supply chain management practices: Impact on performance. *Supply Chain Management: An International Journal* 17(3): 290-305.

Hair, J.F., Ringle, C.M. & Sarstedt, M. 2011. PLS-SEM: Indeed a silver bullet. *Journal of Marketing Theory and Practice* 18(2): 139-152.

Hair, J.F., Ringle, C.M. & Sarstedt, M. 2013. Partial Least Squares structural equation modeling: Rigorous applications, better results and higher acceptance. *Long Range Planning* 46(1-2): 1-12.

Hart, S.L. 1995. A natural-resource-based view of the firm. *Academy of Management Review* 20(4): 986-1014.

Hernaus, T., Bach, M.P. & Vuköic, V.B. 2012. Influence of strategic approach to BPM on financial and non-financial performance. *Baltic Journal of Management* 7(4): 376-396.

Hiroki, I. & Keisuke, O. 2011. How does environmental performance affect financial performance? Evidence from Japanese manufacturing firms. *Ecological Economics* 70(9): 1691-1700.

Hock, C., Ringle, C.M. & Sarstedt, M. 2010. Management of multi-purpose stadiums: Importance and performance measurement of service interfaces. *International Journal Services Technology and Management* 14(2): 188-207.

Jarad, I.A., Yusof, N.A. & Shafiei, M.W.M. 2010. The organizational performance of housing developers in Peninsular Malaysia. *International Journal of Housing Markets and Analysis* 3(2): 146-162.

Jabbour, C.J.C., Maria da Silva, E., Paiva, E.L. & Almada, S.F.C. 2012. Environmental management in Brazil: Is it a completely competitive priority? *Journal of Cleaner Production* 21(1): 11-22.

Lee, S.M., Kim, S.T. & Choi, D. 2012. Green supply chain management and organizational performance. *Industrial Management & Data Systems* 112(8): 1148-1180.

Li, S., Ragu-Nathan, B., Ragu-Nathan, T.S. & Subba Rao, S. 2006. The impact of supply chain management practices on competitive advantage and organizational performance. *Omega* 34(2): 107-124.

Malaysia Productivity Corporation (MPC). 2017. *Malaysia Productivity Report 2016/2017*. Available at http://www.MPC.gov.my

Malaysia Productivity Corporation, (MPC) 2013. *Malaysia Productivity Report 2012/2013*. Available at http://www.MPC.gov.my

Mohd. Nasurdin, A., Tan, C.L. & Khor, B.H. 2014. The influence of organizational creative climate on product innovation: A study of Malaysian manufacturing firms. *International Journal of Economics and Management* 8(1): 40-69.

Mohammad, A.H., Rashid, B. & Tahir, S. 2013. Assessing the influence of Customer Relationship Management (CRM) dimensions on organization performance: An empirical study in the hotel industry. *Journal of Hospitality and Tourism Technology* 4(3): 228-247.

Montabon, F., Sroufe, R. & Narasimhan, R. 2007. An examination of corporate reporting, environmental management practices and firm performance. *Journal of Operations Management* 25(5): 998-1014.

Nese, Y., Ali, B. & Cengiz, K. 2012. Application of Fuzzy multi-criteria decision making methods for financial performance evaluation of Turkish manufacturing industries. *Expert Systems with Applications* 39(1): 350-364.

Noor Aslinda, A.S, Norhayati, Z., Ahmad, J. & Mohd Shoki, M.A. 2012. Green Supply Chain management: A review and research direction. *International Journal of Managing Value and Supply Chains* 3(1): 1-18.

Preacher, K.J. & Hayes, A.F. 2008. Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods* 40: 879-891.

Richard, P.J., Devinney, T., Yip, G. & Johnson, G. 2009. Measuring organizational performance: Towards methodological best practice. *Journal of Management* 35(3): 718-804.

Rosenzweig, E.D. & Roth, A.V. 2004. Towards a theory of competitive progression: Evidence from high-tech manufacturing. *Production and Operations Management* 13(4): 354-68.

Schloderer, M.P., Sarstedt, M. & Ringle, C.M. 2014. The relevance of reputation in the nonprofit sector: The moderating effect of socio-demographic characteristics. *International Journal of Nonprofit and Voluntary Sector Marketing* 19(2): 110-126.

Seebacher, G. & Winkler, H. 2014. Evaluating flexibility in discrete manufacturing based on performance and efficiency. *International Journal of Production Economics* 153: 340-351.

Sekaran, U. & Bougie, R. 2010. *Research Methods for Business: A Skill Building Approach*. Wiley, UK.

Shi, V.G., Koh, S.L., Baldwin, J. & Cucchiella, F. 2012. Natural resource based green supply chain management. *Supply Chain Management: An International Journal* 17(1): 54-67.

Soo, W.K. 2006. Effects of supply chain management practices, integration and competition capability on performance.

Supply Chain Management: An International Journal 11: 241-248.

Sroufe, R. 2003. Effects of environmental management systems on environmental management practices and operations. *Production and Operations Management* 12(3): 416-431.

Suzari, A.R. & Jayaraman, K. 2014. Sustainable financial supply chain in global manufacturing companies. *International Journal of Organizational Innovation* (Special Issue): 18-25.

Tan, C.L., Goh, Y.N. & Chan, H.S. 2015a. A model linking institutional factors and green initiatives: A study among the private higher education institutions. *Journal of Sustainability Science and Management* 10(2): 52-64.

Tan, C.L., Goh, Y.N. & Chan, H.S. 2015b. The determinants of competitiveness in quality: A study among the Malaysian private higher education institutions. *Problems and Perspectives in Management* 13(2): 371-379.

Tan, C.L., Mohd. Zailai, Tan, S.C. & Shaharuddin, M.R. 2016. The impact of green supply chain management practices on firm competitiveness. *International Journal Business Innovation and Research* 11(4): 539-558.

Testa, F. & Iraldo, F. 2010. Shadows and lights of GSCM (Green Supply Chain Management): Determinants and effects of these practices based on a multi-national study. *Journal of Cleaner Production* 18(10-11): 953-962.

Thrulogachantar. P. & Zailani, S. 2011. The influence of purchasing strategies on manufacturing performance: An empirical study in Malaysia. *Journal of Manufacturing Technology Management* 22(5): 641-663.

Vachon, S. & Klassen, R.D. 2007. Supply chain management and environmental technologies: The role of integration. *International Journal of Production Research* 45(2): 401-405.

Vachon, S. & Klassen, R.D. 2008. Environmental management and manufacturing performance: The role of collaboration in the supply chain. *International Journal of Production Economics* 111(2): 299-315.

Yang, C.L., Lin, S.P., Chan, Y.H. & Sheu, C. 2010. Mediated effect of environmental management on manufacturing competitiveness: An empirical study. *International Journal of Production Economics* 123 (1): 210-220.

Zhu, Q. & Sarkis, J. 2004. Relationships between operational practices and performance among early adopters of green supply chain management practices in Chinese manufacturing enterprises. *Journal of Operations Management* 22(3): 265-289.

Cheng Ling Tan (corresponding author)
Graduate School of Business
Universiti Sains Malaysia
11800 USM Pulau Pinang, MALAYSIA.
E-Mail: tanchengling@usm.my

Sook Fern Yeo
Faculty of Business
Multimedia University
75450, Bukit Beruang, Melaka, MALAYSIA.
E-Mail: yeo.sook.fern@mmu.edu.my

Chea Huat Low
Graduate School of Business
Universiti Sains Malaysia
11800 USM Pulau Pinang, MALAYSIA.
E-Mail: chlowc@yahoo.com