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A Review: The Impacts of Green Practices Adoption on Green Performance in the Malaysian Automotive Industry

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Abstract

Green practices are increasingly implemented in the automotive industry. Green practices development in a broad context that includes performance, the competitive of green and the internal organization of the firm. A set of assessment measurement of green practices is expected to be suitable to innovation characteristics and improve in green performance in the Malaysian automotive industry. Thus, the aim of this study is to investigate the impact and relationship between green practices and green performance in Malaysian automotive industry. The conceptual model using Structural

Equation Modeling (SEM) has been proposed. This model will be used to study the relationship between green practices and green performance for Malaysian automotive industry. Based on the proposed conceptual model and reviewed, research hypotheses are being developed.

Keywords: Green practices; Green performance; Environmental; Structural equation model.

1. Introduction

In this globalization era, the role of continuous quality initiatives and green technology within organization has improved and matured throughout history. To increase competition, firms need to apply lot of Green Practices (GPs) such as green supply chain management practices, green lean six sigma, and green balanced scorecard strategy and so on. Automotive industry is the most actively involved industry in the environment management system effort; reduce waste strategy, strategic green improvement activities, development of green supply chains, and adoptability green innovation and technology advanced.

Some industry have committed to reducing negative impacts of their operations on the environment. The resulting "Green" systems have created amazing reductions in energy consumptions, waste generation, and hazardous materials used while also building the company's image as socially responsible organizations. Automotive industry has contributed positively to the world economy in general and Malaysia in particular to themselves, but the processes and products have a negative impact on the environment. According to Orsato and Well (2006) said that automotive industry is a huge industry, diverse and influential than other industries. In addition, the largest single

manufacturing sector worldwide, the management practices, organizational forms, and particularly the response to environmental pressure adopted by this industry are important in their own right, but also in terms on influencing much other performance.

Besides that, in automotive industry, the demand for Environmental Management System (EMS) and ISO 14001 registration is required, as many car manufacturer require that their supplier to obtain it. ISO 14001 registrations requires the existence of proper quality plans, programs, documentation, and procedures. Relation to that, most of the automotive industry adopt to GPs for completion, supply chain pressure, regulatory policy and increase green performance Gonzalez-Benito and Gonzalez-Benito, (2005). This support by Hamner (2006) argued that green performance would increase by educating by educating suppliers about green issues and assist their suppliers to implement GPs. Russo (2001) found that a company that uses of GPs and the effect of giving a positive response to the industry. In addition, the implementation of the GPs such as EMS (ISO 14001) is one of the significant operational impacts of green toxic emissions performance better.

Increasing pressures from a variety of directions have caused the automotive industry to consider and initiate implementation of GPs to improve industry's economic, environmental, operational, and innovation performance. According to Nunes and Bennett (2010) found that green buildings, eco-design, green supply chain, green manufacturing, reverse logistics and innovation are environmental alternative of GPs affecting the operations carried out by the three major automotive industries. This support by Gonzalez *et al.,* (2008) that the Chinese automotive supply chain enterprises

have experienced high and increasing regulatory and market pressures and at the same time have strong internal drivers for GPs adoption that GPs implementation has slightly improved on environmental and operational performance. Hence, to improve green performance, companies must adopt GPs in its operations, particularly in production and finally after-sales operations. Thus, we believe by exploring the GPs, it will be benefit toward automotive industries in order to improve green performance.

2. Literature Review

Automotive industry has to implement GPs in their activities through design for environment such as extended product, full cost accounting, life cycle analysis and extended product responsibility to support of the development in their activities with minimized environmental impact during the whole life cycle. According to Montabon *et al.,* (2007) indicates that industry may become environmentally proactive in anticipation of more efficient utilization of resources and improved their performance and corporate image in adopting GPs. Besides that, GPs can give more impacts of many have highly successful at increasing efficiency, reducing costs, improving customer response time, and contributing to improved quality, greater profitability, and enhance public image (Bergmiller and McCright, 2009).

Generally, GPs are the focal constructs in the theorized model with internal environmental management, technology integration, logistic management, customer focus and, supplier management as antecedents and environmental, economic, operational and innovation performance as consequences. Definitions of the constructs

of GPs incorporated in Table 1.

Table 1: Construct definitions

Construct	Operational definition
Internal Environmental Management (IEM)	The practice of developing environmental as a strategic organizational imperative from senior and mid-level managers (Zhu *et al.,* 2008)
Technology Integration (TI)	Technological integration can be defined as tacit knowledge sharing taking place between a buying and a supplying organization in strategic areas like product development, process and reengineering, and technical training (Vachon and Klassen, 2006), the systems that have been modified and are used to monitor green practices and outcomes (Esty and Winston, 2006)
Logistic Management (LM)	The integrated life-cycle management of green practices flowing from supplier, through to manufacturer, customer, and closing loop with reverse logistics

	(Bergmiller and McCright, 2009), information sharing about supply chain inventory, production planning, and production scheduling can be leveraged to improve procure management and material flow (Zhu *et al.,* 2008)
Customer Focus (CF)	Cooperation with customers that affect the design and development of their customer's environmental practices (Zhu *et al.,* 2008)
Supplier Focus (SF)	Cooperation with suppliers that purpose of developing products that are environmentally (Zhu *et al.,* 2008)

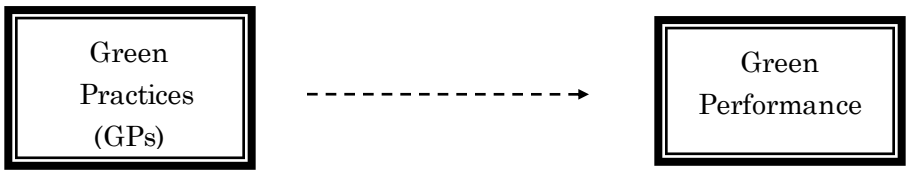


Figure 1: Framework of the study

2.1 Green Practices (GPs) Implementation in Malaysian Automotive Industry Context

The automotive industry's positive contribution that can be viewed from various aspects of products and process should provide a significant green impact. The main goal of the

green movement in automotive industry is to change industrial practices to reduces or eliminate environmental hazards (Stewart, 2001). Several studies suggested the implementation of GPs such as supply chain management practices, green lean six sigma, and green balanced scorecard strategy and so on as an effective method to improve green performance especially economic and environmental performance (Montabon *et al.,* 2007; Bergmiller and McCright, 2009; Lin, 2011; Chien and Shih, 2007).

Therefore, based on results of previous exploratory research (Vachon and Klassen, 2006; Esty and Winston, 2006) that this study conceptualizes of GPs implementation as encompassing in five different dimensions of practices including IEM, TI, LM, CF, and SF. The implementation of GPs is except to result in improved green performance as measured by reductions in air emissions, effluent waste, solid waste, and the consumption of toxic materials. In the process of environmental management in automotive industry, GPs needs to consider the processes of product design, raw material purchasing, product manufacturing, recycling programs, and containing and disposal of hazardous materials (Lin, 2011).

2.2 Internal Environmental Management (IEM)

According to Vachon and Klassen (2006) found that GPs of the activities involving environmental issues and performance that includes both internal and external activities of manufacturing. IEM is the practice of developing green supply chain management as a strategic organizational imperative through commitment and support

of imperative from senior and mid-level managers (Zhu *et al.,* 2008). According to Green Jr. *et al.,* (2012) indicates that IEM is positively associated with green information systems and both appear as antecedents to successful implementation of green purchasing, cooperation with customers, eco-design and investment recovery. Besides that, Gonzalez and Gonzalez (2005) also found that environmental management can bring about competitive opportunities for companies. Among these practices are natural pollution prevention, recycling waste and spent products, extract resources and raw materials, and avoidance of harmful contamination, followed by proper disposal.

2.3 Technology Integration (TI)

Esty and Winston (2006) suggested that TI as known as information system that have been modified and are used to monitor environmental practices and outcomes. Chen (2005) noticed that green information the information necessary to make decisions about eco-design, in terms of materials and energy consumption, reuse, recycling and recovery of materials. According to Vachon and Klassen (2006), TI can define that with primary suppliers and a major customer was positively linked to include not only structural aspects related to methods and managerial systems. Furthermore, they also suggested that existing TI within a supply chain can be expected to positively influence cooperative activities related to environmental issues.

2.4 Logistic Management (LM)

According to Chen (2005), managers should monitor two aspects of green purchasing: (1)

the screening of supplier, products, and logistics systems; and (2) vendor selection, eco-labeling of parts, and environmental influences of logistics systems. Vachon and Klassen (2006) found that for LM a linkage was found only with environmental monitoring of suppliers. Finally, as the supply base was reduced, the extent of environmental collaboration with primary suppliers increased. Refer to Lin (2011) indicates that green purchasing can known as LM that has positive effects on environmental performance and indirect impact on competitiveness.

2.5 Customer Focus (CF) & Supplier Focus (SF)

According to Lai (2005) have identified opportunities for suppliers to cooperate with their customers and even affect the design and development of their GPs. To obtain more solution, the environmental properties of products and services must meet customer requirements. Zhu and Sarkis (2004) suggested that customers and suppliers also can influence of the natural environmental organizational decisions not only affect the organization that makes the decision.

3. Green Performance Measures

There are many studies proven that implementation of GPs given positively results especially in manufacturing process. According to Zhu *et al.,* (2007) found that implementation of GPs has slightly improved environmental and operational performance then created opportunities such as able to expand the company's market. Besides that, study by Lin (2011), implementation of GPs such as GSCM and Total

Quality Environmental Management (TQEM) increased green performance which is perform better in all aspects on environmental management. There might be different GPs that can indicate in different green performance improvements. Thereby, this study separately in different green performance measures such as environmental, economic, operational and innovation performance as consequences for this study. There for, below shows definitions of green performance measure incorporated in Table 2.

Table 2: Measure of green performance

Measure	Definition
Environmental Performance	Environmental performance relates the ability of manufacturing plants to reduce air emissions, effluent waste, and solid wastes and the ability to decrease consumption of hazardous and toxic materials (Zhu *et al.,* 2008; Montabon*et al.,* 2007; Wagner, 2008)
Economic Performance	Economic performance relates to the manufacturing plant's ability to reduce costs associated with purchased materials, energy consumption, waste treatment, waste discharge, and fines for environmental accidents (Zhu *et al.,* 2008; Zhu and Sarkis, 2004; Wagner, 2008)
Operational Performance	Operational performance relates to the

	manufacturing plant's capabilities to more efficiently produce and deliver products to customers (Zhu *et al.,* 2008; Chien *et al.,* 2007)
Innovation Performance	Innovation performance can defined as measures of green practices in develop new ideas and behavior to produce product and processes and at the same time can contribute to a reduction of environmental burdens (Montabon *et al.,* 2007; Wagner, 2008; Rennings, 2000)

4. Research Hypotheses

To understand the relationship each of GPs on green performance in Malaysian industry, the following hypotheses were set up to be tested. According to literature review above, these hypotheses will be stated based on a numbering system from H1. This style of hypothesis statement is chosen due to the nature of answering hypotheses using Structural Equation Model (SEM) methods.

H_1: There is a positive and direct significant relationship between green practices implementation and green performance in Malaysian automotive industry

According to Chiou *et al.,* (2011) implementation of GPs in industry will be improve

and increase their green performance at the same time to enhance their competitive advantage in the global market. Furthermore, refer to study by Zhu and Sarkis (2004) they found that GPs of which TQEM and ISO14000 are in place can provide less negative green performance if GPs is in place. Besides that, they also sugeested that investment especially in GPs is necessary for early adoption success, in terms of green performance. As discussed above, Malaysian automotive industry can improve their green performance by implementing GPs.

5. Methodolgy

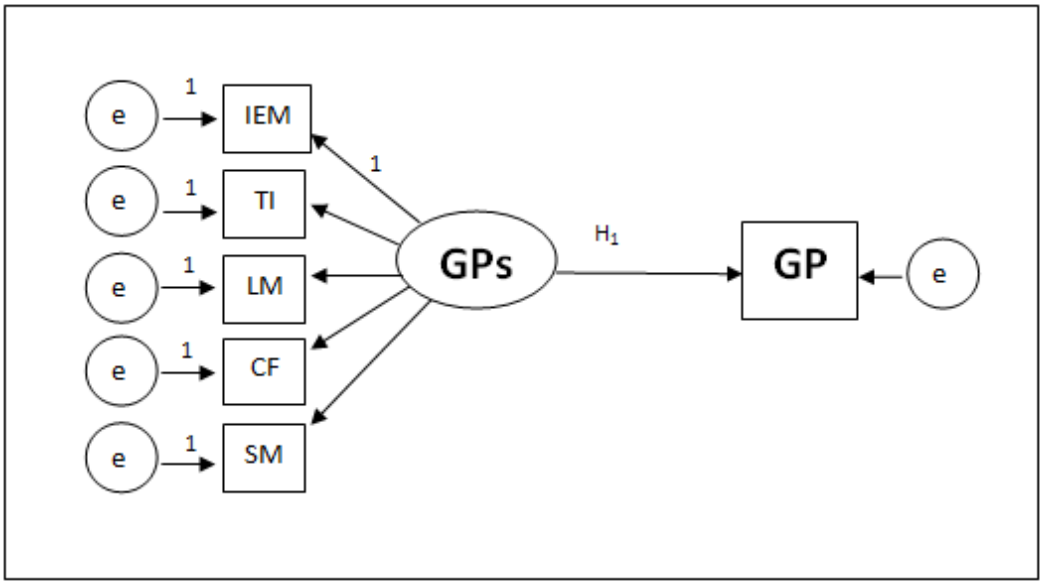
Automotive industry were chosen because the use of quality initiative and performance measurement in this sector is very important (Zakuan, 2009). It is an important industrial driver of industrial management and development, because it brings together various components, which are manufactured by suppliers in other industries (Chin and Saman, 2004). The sample should be a subset of the total population, which has the characteristics of the population. In this study, samples were selected from the list of PROTON and PERODUA automotive suppliers. In achieving the objectives of the study, the Malaysian automotive suppliers firms are select as the population and the data will obtain from Proton Vendor Association (PVA) and Kelab Vendor Perodua (KVP). These lists of automotive suppliers consist of electrical, electronic, metal, plastic, rubber , and other automotive part.

Structural equation modeling techniques was utilize to perform the requirestatistical analysis of the data from the survey. Exploratory factor analysis,

reliability analysis and confirmatory factor analysis to test for construct validity, reliability, and measurements loading were performed. Having analyzed the measurement model, the structural model was then tested and confirmed. The statistical Package for the Social Sciences (SPSS) version 17 was used to analyze the preliminary data and provide descriptive analyses about thesis sample such as means, standard deviations, and frequencies. Structural Equation Modeling (SEM using AMOS 6.0) will use to test the measurement model.

6. A Proposed Research Model

SEM is not only estimates multiple interrelated relationships but also has the ability to incorporate latent constructs into an analysis. A latent construct cannot be measured directly but can be approximated by observed or measured variable. The measured variables are obtained from respondents in response to a set of questionnaire. The research model aims at analyzing of the relationship between GPs and green performance for Malaysian automotive industry. This model is called mediating model as presented in Figure 2.



*Note: GPs= Green practices, GP= Green Performance, IEM= Internal Environmental Management, TI= Technology Integration, LM=Logistic Management, CF= Customer Focus, SM= Supplier Focus

Figure 2: Model of the study

7. Conclusion

GPs and green performance has become most important of green initiatives and it involves local car manufacturers and automotive suppliers in their effort to become more environmentally effective and competitive in pursuing to enhance the organization ability to improve green innovation and technology development, and green performance (Conding *et al.,* 2012). This study expected to provide valid and reliable for instrument and structural relationship model for green practices constructs.

Many studies have been performed to identify critical success factors for successful

implementation GPs. However, no previous study had tried to investigate the relationships between GPs and green performance, especially in Malaysian automotive industries. A conceptual model has been proposed to examine the relationships between GPs and green performance in the automotive industry in Malaysia. Based on proposed model and a previous study, research hypotheses are being developed. The next step of this study is to design a questionnare, which will be used for pilot study data collection in automotive industry in Malaysia.

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