GREEN PRACTICES, GREEN INNOVATION, AND GREEN PERFORMANCE IN MALAYSIAN AUTOMOTIVE INDUSTRY

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ABSTRACT

The purpose of this study is to investigate the structural relationship between Green Practices (GP), Green Innovation (GI), and Green Performance (GPM). This quantitative study developed a model for the Malaysian automotive industry which incorporates the three variables. A survey through questionnaire was conducted to determine the level of GP implementation, GI as well as GPM measurement. A number of 230 sets of questionnaire were successfully collected from Malaysian automotive companies which yielded a 57.5% response rate. Structural equation modeling technique was used to test the statistical analysis of the data required in the study. Exploratory factor analysis, confirmatory factor analysis and reliability analysis to test construct validity, reliability, and measurements loading were performed. The testing and confirmation results reveal that GI does not affect the relationship between GP and GPM. However, the study suggests that GI assists in improving GPM when coupled with GP. In short, the impact of GP implementation on GPM increases with a mediating of GI practices in the Malaysian automotive industry. This study also contributes to the knowledge on green management and practical guidelines for automotive practitioners to improve their green performance.

AMALAN HIJAU, INOVASI HIJAU DAN PRESTASI HIJAU DALAM INDUSTRI AUTOMOTIF DI MALAYSIA

ABSTRAK

Tujuan kajian ini adalah untuk menyiasat hubungan antara Amalan Hijau (GP), Inovasi Hijau (GI) dan Prestasi Hijau (GPM). Kajian kuantitatif ini membangunkan model yang menggabungkan ketiga-tiga pemboleh ubah ini untuk industri automotif di Malaysia. Sebanyak 230 set soal selidik berjaya dikumpulkan daripada syarikat automotif di Malaysia dengan membawa kepada 57.5 % kadar balasan. Model persamaan berstruktur telah digunakan untuk menganalisa data. Analisis faktor penerokaan, analisis faktor pengesahan dan analisis kebolehpercayaan digunakan bagi tujuan pengesahan konstruk, kebolehpercayaan dan model pengukuran yang dilaksanakan. Hasil ujian dan dapatan mengesahkan bahawa GI tidak memberi kesan kepada perhubungaan antara GP dan GPM. Walau bagaimanapun, kajian ini menunjukkan gabungan GI dengan GP memberi kesan yang lebih baik kepada GPM. Secara ringkas, kesan pelaksanaan amalan GP ke atas GPM semakin meningkat dengan adanya pengantara GI dalam industri automotif di Malaysia. Kajian ini juga menyumbangkan dari segi pengetahuan mengenai pengurusan hijau dan garis panduan yang praktikal kepada pengamal automotif untuk meningkatkan prestasi hijau.

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LIST OF ABBREVIATIONS

ASEAN	Association of Southeast Asian Nations
AFTA	ASEAN Free Trade Area
AGFI	Adjusted Goodness of Fit Index
AMOS	Analysis of Moment Structures
BMW	Bavaria Motor Works
BN	Breno Nunes
CF	Customer Focus
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Indexes
CSFs	Critical Success Factors
DE	Direct Effect
DV	Discriminant Validity
ECP	Economic Performance
EFA	Exploratory Factor Analysis
EFP	Environmentally-Friendly Practices
EMA	Environmental Management Accounting
EMS	Environmental Management System
ENP	Environmental Performance
EP	Environmental Performance
FM	Frank Montabon
GFI	Goodness of Fit
GI	Green Innovation

GP	Giorgos Papagiannakis
GP	Green Practices
GPM	Green Performance
GPSI	Green Process Innovation
GPTI	Green Product Innovation
HICOM	Heavy Industry Corporation of Malaysia
IE	Indirect Effect
IEM	Internal Environment Management
IMCA	International Marine Contractors Association
IP	Innovation Performance
KMO	Kaiser-Meyer-Olkin
KWGJ	Kenneth W. Green Jr
KVP	*Kelab* Vendor PERODUA
LC	Letter of Credit
LCA	Life Cycle Assessment
LM	Logistics Management
MAA	Malaysian Automotive Association
MC	Mitsubishi Corporation
MIDA	Malaysian Industrial Development Authority
MITI	Ministry of International Trade and Industry
MMC	Mitsubishi Motor Corporation
MODENAS	*Motosikal dan Enjin Nasional Sdn. Bhd*.
MPC	Malaysia Productivity Corporation
MTB	Malaysian Bus and Track

NAP	National Automotive Policy
NEP	New Economic Policy
NGO	Non-governmental Organization
OLC	Operational Life-Cycle Stages
OP	Operational Performance
PERODUA	*Perusahaan Otomobil Kedua Sdn. Bhd*
PROTON	*Perusahaan Otomobil Nasional Berhad*
PMS	Performance Measurement Systems
PVA	Proton Vendor Association
rc	Canonical Correlation
RMSEA	Root Mean Square Error of Approximation
SAE	Dupont Automotive
SEM	Structural Equation Modeling
SF	Supplier Focus
SIRIM	Standard and Industrial Research Institute of Malaysia
SMEs	Small and Medium-Sized Enterprises
SPSS	Statistical Package for the Social Sciences
STP	Total Vendor Supply two part to PROTON or/and PERODUA
TI	Technology Integration
TLI	Tucker Lewis
TVAMSB	Total vendor after deducting supply both to PROTON and PERODUA
TVAMSTP	Total vendor after deducting vendor supply two parts to PROTON and PERODUA
TVPP	Total vendor PROTON and PERODUA
TVSB	Total vendors supply both in PROTON and PERODUA

UNIDO	United Nations Industrial Development Organization
WTO	World Trade Organization
ZMS	Zameri Mat Saman

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CHAPTER 1

INTRODUCTION

1.1 Background of Research

In this era of globalization, quality initiatives and green technology within an organization are most important to improve the automotive industry's performance. Recently, the global automotive industry has undergone a fundamental transformation in order to increase their performance through green impacts. According to Sofia (2010), more than half of the companies surveyed in the automotive industry have started to focus on environmental factors, such as fuel economy, emissions and clean air regulations and actually all the factors are the industry's biggest challenges. Thus, to solve these challenges, the automotive industries need to find a new green technique such as adoption

of the Green Practices (GP) and emphasis on Green Innovation (GI) to enhance the industry's Green Performance (GPM).

The result of "Green" activities has created reductions in energy consumption, waste generation and hazardous materials used while improving the industry's profits and performance (Theyel, 2000). Therefore, GP and GI are predicted to be the most important performance indicators and mediators for the competitive advantage of industry in the future. According to Orsato and Well (2006), automotive industry is a huge industry, diverse and influential than other industries. 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 many other activities. Therefore, the implementation of GP in such industry is an expected indicator to be suitable with GI characteristics to improve the GPM. This is because the automotive industry has contributed positively to the world economy in general and Malaysia in particular, but the processes and products have a negative impact on the environment (Zakuan, Saman, & Hemdi, 2012).

GP has become a priority and related with GI as a mediating has become an increasingly common for most large organizations. There is a positive increase in the number of companies committed and also involved and determinants of higher investments towards environmental improvements especially regarding their practices and innovation side (Comoglio & Botta, 2012). However, how can the Malaysian automotive industry achieve their profitability by improving the environmental impacts? And what

role is played by the industry with implementing of GP and the mediating effects of GI in the bigger picture to achieve better performance in the Malaysian automotive industry?

Table 1.1

Total Production in Selected ASEAN Countries

Vehicles	2005	2006	2007	2008	2009	2010
Malaysia	563 408	502 973	441 661	530 810	489 269	567 715
Thailand	1 122 712	1 194 426	1 287 346	1 393 742	999 378	1 644 513
Indonesia	500 710	297 062	411 638	600 628	464 816	704 715

Sources: MAA (2011), MIDA (2012)

Table 1.2

Total Sales in Selected ASEAN Countries

Vehicles	2006	2007	2008	2009	2010
Malaysia	490 768	487 176	548 115	536 905	605 156
Thailand	682 500	631 250	615 000	548 871	800 367
Indonesia	317 312	434 499	607 805	486 061	764 088

Sources: MAA (2011), MIDA (2012)

As shown in Table 1.1 and Table 1.2, both Thailand and Indonesia have a strong performance with the amount of production and sales relatively greater than Malaysia. Even though Malaysia's output has rather been stable with around 500 000 vehicles yearly, the result shows that Malaysia is still located in the lowest in production and sales activities compared to Thailand. That means Malaysia needs to focus more on a wide

range of industrial activities and related with a new technique such as implementing green activities ranging from supply of materials to get more production, sales, services, and other auto-related operations (Rosli, 2006). This is also in line with The National Automotive Policy (NAP) objectives which the Malaysian automotive industry needs to explain more about green issues and other safety concerns, to better understand the subject matter of the measures in the currently reviewed NAP (Zulhaidi, Fauziana, Rahmat, Anwar, & Wong, 2012). Table 1.3 below shows the listed 8 objectives of the NAP.

Table 1.3

Objectives of the National Automotive Policy

Develop a competitive and capable domestic automotive industry;
Develop Malaysia as the regional automotive hub in Energy Efficient Vehicle (EEV);
Increase value-added activities in a sustainable way while continuously developing domestic capabilities;
Increase exports of vehicles, automotive components, spare parts and related products in the manufacturing and after market sectors;
Increase the participation of competitive *Bumiputera* companies in the domestic automotive industry including in the after-market sector;
Enhance the ecosystem of the manufacturing and after market sectors of the domestic automotive industry; and
Safeguard consumer interest by offering safer and better quality products at competition price.

Source: MITI (2014)

Furthermore, GP and GI are some of the typical examples as environmentally friendly incentives to help industries develop their activities and have greater potential to gain larger returns and performance. The meaning of greater potential here is that organizations can get more benefits in Environmental Management Accounting (EMA)

such as market gains and cost savings which include lower cost structure, avoiding environmental fines and liabilities and greater productivity due to reduced energy and material consumption (Russo, 2001; Melnyk, Sroufe, & Calantone, 2003; Montabon, Sroufe, & Narasimhan, 2007; Oliveira, Serra, & Salgado, 2010). Besides that, GP and GI also have potential green impacts for monitoring, structuring, developing, achieving, and implementing a firm's products and services, including consumption of material, pollution prevention, waste reduction and cost reduction (Pun, Hui, & Lee, 2001; Pun, Hui, Lau, Law, & Lewis, 2002). It can be concluded that the adoption of GP, GI and GPM in Malaysian automotive industry provide more benefits especially to increase industrial performance.

1.2 Problem Statement

In fact, Malaysia has long been involved in the development of the automotive industry with a different emphasis over time and the attempt to increase performance with various new initiatives in managing processes and operation management which indirectly play an important role in helping the development of the local automotive industry. Thus, to assist NAP in achieving one of its objectives which is to develop high value-added manufacturing activities in niche areas, further research is very important to find the new green techniques particularly for enhancing quality initiatives in the Malaysian automotive industry.