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Effect of Eco-Innovation Practices on Sustainable Business Performance

Salmah Omar[1]*, Norfaridatul Akmaliah Othman[2] and Juhaini Jabar[2]

[1]School of Technology Management and Logistics, Universiti Utara Malaysia, 06010 Sintok, Kedah, Malaysia
[2]Faculty of Technology Management and Technopreneurship, Universiti Teknikal Malaysia Melaka, Durian Tunggal, 76100 Melaka, Malaysia

ABSTRACT

The evolution of 'sustainability' reflects a crucial change in global thinking, which is forcing firms to re-evaluate their approach in measuring organisational performance. The objectives of this study are to examine the extent of eco-innovation practices and their effects on sustainable business performance of chemical companies in Malaysia. The results show a moderate to a considerable extent of eco-innovation practices among the companies.

Keywords: Chemical industry, eco-innovation, organisational performance, performance, sustainable performance

INTRODUCTION

In the past, environmental issues have been considered burden to business, associated with costs and restrictions which impede companies' competitiveness. However, in recent times, the environmental agenda has been found a place among richer economies to see the emergence of proactive environmental strategies. The importance of green competitiveness has been recognised and it goes beyond business.

Unfortunately, the problems related to environmental pollution are yet to be solved. Industrial development and rapid urbanisation are responsible for major environmental problems; among them, disposal of hazardous and communal waste, pollution of air and water. The chemical industry, without proper environmental management, has poses a challenge on sustainability. Thus, many chemical companies have been at the forefront

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E-mail addresses:
salmah@uum.edu.my (Salmah Omar),
norfaridatul@utem.edu.my (Norfaridatul Akmaliah Othman),
juhaini@utem.edu.my (Juhaini Jabar)
*Corresponding Author

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of adopting innovative technologies and state-of-the-art environmental management practices. As a result, adoption of eco-innovation in this sector is very significant.

At the macro level, sustainable development was popularised in a report published by the World Commission on Environment and Development in 1987. Also known as the Brundtland report, it defines sustainable development as "development which meets the needs of the present without compromising the ability of future generations to meet their own needs" (Murphy & Drexhage, 2012). Sustainable development embodies three principles: environmental integrity, social equity, and economic prosperity. At the organisational level, a sustainable business has been defined as one that 'meets the needs of its stakeholders without compromising its ability also to meet their needs in the future (Hockets, 2001). Introducing the concept of sustainability into organisational thinking has implications for business strategy, which, in turn, affect how firms measure performance. At the moment, an organisation's sustainability indicators do not indicate any clear or consistent approach – the items suggested are not well justified from a conceptual perspective. This study adopts the Sustainable Balance Scorecard (SBSC) introduced by (Hubbard, 2009) for the purpose of measuring sustainable business performance, which is beyond triple bottom line (TBL).

The reasons behind the proposed relationship between eco-innovation practices and sustainable performance are based on several factors. First, an eco-innovation practice is about the efficient use of raw materials, resulting in lower costs for raw materials and disposal of waste (Hart & Ahuja, 1996). (Porter, Linde, & Porter, 1995) argue that firms that consider resource productivity, process change, and product innovation as priorities can achieve competitive advantage by having lower costs or offering differentiated products (Hart & Ahuja, 1996; Porter et al., 1995). Second, it may lead them to convert waste into usable products and continue to find new ways of converting that provide additional revenues. Third, it offers the potential to cut emissions well below required levels, reducing the firm's compliance and liability costs (Hart, 1997). Fourth, it helps firms to improve their environmentally based leadership reputation relative to competitors. Since reputation is in itself a source of market advantage, this should result in enhanced cash flow and enhanced sustainable performance. The objectives of this study are:

- To show the extent of eco-innovation practices among chemical companies in Malaysia.
- To examine the effect of eco-innovation practices on sustainable business performance.

Impact of Eco-Innovation Practices on Sustainable Performance

Eco-innovation, which is defined as "the production, assimilation or exploitation of a product, production process, service or management or business methods that is novel to the organization (developing or adopting it) and which results, throughout its life cycle, in a reduction of environmental risk, pollution and other negative impacts of resources used (including energy use) compared to relevant alternatives" (Kemp & Pearson, 2007). Given that this study focuses on the chemical industry, the eco-innovations practices of the companies have been integrated with the responsible care code of practice to make it more convenient and reliable. Eco-innovation initially promoted safer chemicals and protection of the environment, but at the same time introduced the principles of energy efficiency, atom economy in chemical processes

with reduction of waste. Some governments introduced lower taxes for industries which applied voluntary alternative "greener" methodologies (Moiseev, 2011; Centi & Perathoner, 2009; Iles, 2008). The issues of energy generation, storage, and transport are all intrinsically linked to the materials that are used, and these materials need to be designed and manufactured using the principles of Green Chemistry (Moiseev, 2011). Considering the effect of eco-innovation practices on sustainability in chemical industry, the hypothesis of this study is as follows:

HA: There is a positive and significant relationship between eco-innovation practices (EIP) and sustainable performance (PER).

MATERIALS AND METHODS

A cross-sectional survey method was employed. Field study refers to non-experimental scientific inquiries designed to discover the relationship among variables in real social structures, such as communities, institutions, and organisations (Kerlinger, 1992).

The population of this study consisted of chemical companies in Malaysia. The sample was drawn from the directory of Federation of Malaysian Manufacturers (FMM). A total of 500 questionnaires were distributed to various chemical companies, and 76 was returned which translated into a response rate 15.2%.

The PLS-SEM was used for data analysis. PLS is a soft modelling approach to SEM with no assumptions about data distribution. Thus, PLS-SEM is a more robust approach and can be used to analyse data with non-normality distribution. Using PLS-SEM, data normality is not important because PLS uses calibration mechanisms, which transform any non-normal data into data that adheres to the central limit theorem (Chin & Dibbern, 2010).

Measurement for Endogenous Variable

Sustainable performance acts as an endogenous variable in this research. Sustainability concepts have dramatically widened the scope of measurement options and leading organisations are grappling with sustainability reporting, but there is no sign of consensus on a common reporting standard and the competing frameworks are impossibly complex. This study adapts stakeholder-based, Sustainable Balanced Scorecard (SBSC) framework by (Hubbard, 2009).

Measurement for Exogenous Variable

The definition of eco-innovation was stretched to include 12 principles of green chemistry (Anastas & Warner, 1998). The 12 principles were then translated into practices which incorporated responsible care code of practices. Responsible Care is an initiative of the chemical industry and adopted by chemical companies to improve continuously safety, health and environmental performance of their operations and products in a manner responsible to public concerns. Chemical Industries Council of Malaysia (CICM) is the Malaysian steward for the Responsible Care initiative of the global chemical industry. At the heart of the Responsible Care, the initiative is the Six Codes of Management Practices, which focus on specific areas of chemical manufacturing, transportation, research, and handling. This study, however, simplified the practices into four categories of eco-innovation practices.

RESULTS AND DISCUSSION

After the preliminary scrutiny, all 73 usable cases were loaded into SPSS version 20 software for the following reasons: 1) generating descriptive statistical reports; and 2) generating exploratory analyses on every variable to check for missing or invalid data. For PLS-SEM analysis purposes, Smart PLS 3.0 was used to analyse the measurement and structural models. Using SmartPLS, data was transformed into an Excel CVS file to generate raw input for the application.

Descriptive Statistic of Variables

The mean and standard deviation of each construct are presented in Table 1. The mean ($\bar{x}$) value range from 3.489 to 3.890 out of a possible value 5.0 on the scale, reflect a moderate to a considerable extent of implementation of eco-innovation practices. This result answer the first research objective: to reveal the extent of eco-innovation practices implementation. Furthermore, the mean ($\bar{x}$) value range from 3.589 to 4.03 out of a possible value 5.0 indicates the ability of the respondent firms in showing better sustainable performance. More specifically, the highest score is for social performance, followed by environmental performance, customer, and internal process, financial, and learning and growing.

Table 1
Descriptive statistic of variables

	Mean	
	($\bar{x}$)	SD
Eco-innovation practices		
Pollution prevention	3.667	.522
Product and process stewardship	3.489	.545
Distribution	3.890	.473
Employee and public health and safety	3.684	.429
Sustainable Performance		
Financial	3.726	.445
Internal process	3.734	.415
Customer	3.750	.455
Learning and growing	3.589	.387
Environmental	3.982	.431
Social	4.030	.521

Path Coefficients (β) in Structural Model

Within the structural model, each path connecting two latent variables represent a hypothesis. The analysis conducted on the structural model shows the conformation of each hypothesis as well as the strength of the relationship between dependent and independent variables. Table

2 lists the path coefficients, observed statistics, and significance level for the hypothesized path. Using the results from the path assessment, the acceptance or rejection of the proposed hypotheses is determined. The result is found to support the hypothesis.

Table 2
Path coefficients, observed t-statistics, significant level

Hypothesis	Path coefficient (β)	Sample Mean (M)	SD	T-Statistics	P-Values	Sig.
EIP -> PER	0.349	0.349	0.129	2.701	0.004	Yes

According to (Hair, Ringle, & Sarstedt, 2011), the path coefficients should have standardised values between -1 and + 1. The value close to +1 represents strong positive relationships and vice versa for the negative value. Very low values close to 0 are usually not significant. The significance of path coefficient was assessed using bootstrapping analysis. Critical values for one-tailed test are 1.645 (significant level = 5%).

CONCLUSION

From the results of the study, the mean ($\bar{x}$) value range from 3.489 to 3.890 out of a possible value 5.0 on the scale, indicates a moderate to a considerable extent of implementation of eco-innovation practices among Malaysia chemical companies. The Path Coefficients (β) supported the hypothesis of this research. Therefore, it can be concluded that there is the positive and significant relationship between eco-innovation practices and sustainable business performance among chemical companies in Malaysia. As such, the study provides empirical evidence indicating that firms can benefit by implementing eco-innovation practices. The result is consistent with those of earlier studies (Cheng, Yang, & Sheu, 2014; Maletic & Dahlgaard, 2014; Özşahin, Sezen, & Çankaya, 2013; Yu & Ramanathan, 2015).

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