Australian Journal of Basic and Applied Sciences, 10(7) Special 2016, Pages: 34-40

ISSN:1991-8178

Australian Journal of Basic and Applied Sciences

Journal home page: www.ajbasweb.com

The Effects of Stakeholder Pressure on Eco- Innovation Practices in Malaysian Chemical Industry

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ARTICLE INFO

Article history:
Received 10 January 2016
Accepted 15 February 2016
Available online 28 February 2016

Keywords:
Stakeholder pressure, Eco-innovation practices, PLS modeling

ABSTRACT

Background: Environmental activities are increasingly seen as a potential source of competitive advantage. Malaysia also realized investing in environmental protection becomes increasingly important. The term environmental innovation or eco-innovation relates to innovations aiming at a decreased negative influence of innovations on the natural environment. Thus, it is important to identify the processes and agenda governing the development of the sustainability of an organization. . It is therefore vital to understand what motivates companies to implement eco-innovation practices as environmentally friendly solutions. **Objective:** In this study, the conceptual framework is proposed and tested between stakeholder pressure (SHP) and eco-innovation practices (EIP). **Results:** EIP is influenced directly by SHP (β=0.390, t=3.686, p<0.000)**.** **Conclusion:** The findings of this study reveal that stakeholder pressure (SHP) is an important antecedence in affecting eco-innovation practices. This variable concerns receiving pressure from government, especially local government, environmental and enforcement agencies, and national legislator will influence the extent of eco-innovation practices implementation.

To Cite This Article: Salmah Omar and Dr. Norfaridatul Akmaliah Othman., The Effects of Stakeholder Pressure on Eco- Innovation Practices in Malaysian Chemical Industry. ***Aust. J. Basic & Appl. Sci.,*** *10(7): 34-40, 2016*

INTRODUCTION

Environmental sustainability is one of the defining issues nowadays, and future decades. Issues concerning sustainability have reached great social awareness, breaking news addressing climate change, corporate social responsibilities and impacts of corporate business activities being broadcast regularly across all media channels. A stable society is an essential requirement for business to operate profitably in the long term. If business activities break down social harmony or cause significant damage to the ecological system, human life cannot be sustained and economic activities will be eliminated in the long run (Unerman & O'Dwyer, 2007). Thus, the environmental issue, with its increasing severity and global nature of the problems, is often referred to as the greatest challenge mankind has to face in the near future.

In a profit oriented economic system, it is clear that this process cannot rely solely on the environmental consciousness of market players. Other drivers are also necessary, be it the cost savings associated with improved efficiency, or external pressure from the authorities or other actors. It is therefore vital to understand what motivates companies to implement environmentally friendly solutions.

In a rare exception, Kagan, Thornton, & Gunningham (2002) examined the external and internal pressures that drive firms to improve their environmental performance beyond regulatory compliance in the pulp and paper industry. As recently pointed out that our understanding of factors that foster strong environmental management practices within a firm still remains limited (Klassen, 2001).

Managers have now recognized the importance of stakeholder input and engagement and the potential impact on long-term corporate profitability. The consequences for businesses when they do not effectively consider the impacts of their activities on society are often substantial. Thus, effective management of stakeholder impacts and relationships is critical. This study offers a perspective that evaluates the relationship of two variables namely stakeholder pressure and eco-innovation practices implementation in Malaysia chemical industry.

The chemicals industry makes products with many beneficial uses, but they can also have negative

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impacts on human health and the environment. The chemical industry is also one of the main emitters of greenhouse gases releasing through the combustion of fossil fuels to generate power. Furthermore, the industry generates more than 40 million tons of waste of which 8 million tons or 20% is hazardous waste(OECD, 2011). Toxic chemicals that enter into the air, water or soil are harmful for the environment and for the health of human beings (Barsoumian & Severin, 2011). Over the entire life of a chemical product (from "cradle to grave") there is a potential for a negative impact on man and the environment.

As in Malaysia, the chemical industry generated the highest amount of waste in 2009 (30.6%), followed by water treatment plants and power stations (13.8%) and electronic (11.5%). Metal and engineering contributes 7.4% and the automotive industry 6.1% (DOE, 2010). Eventhough scheduled waste management in Malaysia is well-established after more than 35 years, nonetheless, problems associated with scheduled waste management and pollution such as lack of sustainable awareness, enforcement, periodical monitoring as well as illegal dumping still exist that necessitate urgent intervention from relevant stakeholders.

As chemical industry give great negative impact towards sustainability issues, adoption of eco-innovation in this sector is very significant. The term environmental innovation or eco-innovation relates to innovations aiming at a decreased negative influence of innovations on the natural environment. It is a new concept of great importance to business and policy makers, covering many innovations of environmental benefit.

The concept of environmental technologies has changed considerable in time with the changing environmental agenda. With a still more preventive approach to environmental issues innovation and eco-innovation is becoming still more entangled, none the least for the companies. Sharp, consolidated and operational definitions are lacking. Statistical data are poor and suffer from the lack of a more stringent taxonomy of eco-innovations. Furthermore eco-innovation and green chemistry practices is still in the early development stage in Malaysia. Therefore, exploring the adoption of eco-innovation in chemical industry is essential as it can develop the understanding on what drive or motive the eco-innovation adoption.

This raises the following central question: assuming that firms are profit maximizers and eco-innovation solutions lead to 'win-win' solutions, why are these not been more widely used, and why do some plants implement eco-innovation solutions, while others do not? What motivates them to implement the eco-innovation solutions or practices? Within this context, the aim of this study is to explore the following research questions;

i. Does the stakeholder pressure influence the eco-innovation practices?
ii. Which pressures are the most significant predictors in eco-innovation practices?

To solve the stated research problem, partial least squares (PLS) path modeling is utilized in this study.

Literature Review:

About 21 years ago, (Porter, 1991) important hypothesis argued that more stringent environmental regulations could spur innovation, thereby offsetting the additional costs to business and consumers of regulation(Ambec, Cohen, Elgie, & Lanoie, 2013). This became a key argument in the debate about sustainable development (given political force at the Rio Earth Summit in 1992. Technological, organisational and behavioural change came to be seen as the principal means by which the conflicting objectives of economic growth, environmental protection and social development could be reconciled. One outcome of these developments was the growth of a broad new research agenda about technological innovation and environmental (eco-Innovation) policy which has also had a marked impact on environmental, innovation and trade policies in Europe, the USA and increasingly also in Asia (Berkhout, 2011).

However, the concept of eco-innovation is currently ill-defined which reflects the novelty of the concept but also lacking theoretical consistency. As is common in environmental research a broad range of theoretical perspectives have started to use the concept which leads to less analytical rigour.

Eco-innovation in Chemical Industry:

The chemical industry plays a key role in sustaining the world economy and underpinning future technologies, yet is under unprecedented pressure from the effects of globalization and change in many of its traditional markets. Against this background, what will be needed for the industry to embrace efforts to make it "greener"?

Most processes that involve the use of chemicals have the potential to cause a negative impact on the environment. It is therefore essential that the risks involved be eliminated or at least reduced to an acceptable level. Traditionally, the risks posed by chemical processes have been minimized by limiting exposure by controlling so-called circumstantial factors, such as the use, handling, treatment, and disposal of chemicals. The existing legislative and regulatory framework that governs these processes focuses almost exclusively on this issue. By contrast, green chemistry seeks to minimize risk by minimizing hazard. It thereby shifts control from circumstantial to intrinsic factors, such as the design or selection of chemicals with reduced toxicity and of reaction pathways that eliminate by-products or ensure that they are benign. Such design reduces the ability to manifest hazard (and therefore risk), providing inherent safety from accidents or acts of terrorism.

Legislation has been effective in improving environmental conditions, but toxic materials are still discharged in considerable amounts (7 billion pounds) in 2000 in the United States alone (Poliakoff, 2002). Regulation clearly has a major and continuing role to play in lessening the environmental impact of the chemical industry. Eco-innovation can potentially generate an even greater environmental benefit by removing the intrinsic hazard of particular products or processes, thereby moving them outside the scope of many environmental regulations.

The Chemicals' Industry's approach to encourage compliance with existing regulations and to improve its public image come in the form of an initiative called the Responsible Care Programmed (RCP) which was launched in 1994. This programme is designed to show that the industry can voluntarily put into place measure for the effective management of the hazard that come with the use and handling of chemicals.

The 12 principles of green chemistry (Anastas and Warner, 1998) then has been translated into practices which incorporated with the 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 manner responsible to the concerns of the public. Chemical Industries Council of Malaysia (CICM) is the Malaysian steward for the Responsible Care initiative of the global chemical industry. At heart of the Responsible Care initiative are 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 category of eco-innovation practices: (i) pollution prevention (ii) product and process stewardship (iii) distribution (iv) employee and public health and safety.

Stakeholder Pressure:

(Morsing & Schultz, 2006) emphasize that the capacity of a firm to generate sustainable wealth over time, and hence its long-term value, is determined by its relationships with critical stakeholders and any stakeholder relationship may be the most critical one at a particular time or on a particular issue.

Thus, addressing stakeholder demands beyond the direct contractual partners of private firms has become an increasingly relevant topic for their managers as well as for public officials involved in policy making. Partly, the interest is motivated by an increasing recognition of environmental and, more generally, sustainability challenges, partly by the empirical finding that stakeholder pressures drive firm actions (Henriques and Sadorsky, 1996; Krajnc and Glavic, 2005; Qi *et al*., 2010).

Stakeholders are groups and individuals who benefit from or are harmed by, and whose rights are violated or respected by, corporate actions. Several empirical research founds that stakeholder pressures drive firm actions (Henriques and Sadorsky, 1996; Krajnc and Glavic, 2005; Qi *et al*., 2010). Stakeholder theory can help to classify stakeholder pressures as originating from either within or beyond the firm boundaries, for example in the value chain or the public domain. The extent of pressure for eco-innovation practices was measured from three sources (Darnall, 2009; González-benito, 2004; Lo, Fryxell, & Tang, n.d.; Marquet-Pondeville, Swaen, & Rongé, 2007; Rueda-Manzanares, Aragón-Correa, & Sharma, 2008):

1) Local Government - four items asked the respondent about the extent of pressure they felt from the following stakeholder to implement eco-innovation practices: the government (e.g., mayor, local people’s congress), local environment protection bureau, national legislator and enforcement agencies.

2) Society - Four items enquired about how strongly various community groups willgive pressure for implementing eco-innovation practices: the media, the community through legal action, the community through other means, and environmental interest group.

3) Industry - Six items enquired about the level of pressure from the industry: customers, employees, major competitors (i.e., through fear of losing business to them), suppliers, shareholders and industry associations.

(Wood & Wood, 2012) concurs (under the assumption that decision making in firms relates to performance) when stating that social issues and stakeholder concerns affect the decision making of firms. Burke and Logsdon (1996) see the total pressure exerted by different stakeholder groups (as perceived by firms) positively correlated with the level of activities or practices. Thus the relationship between stakeholder pressure and eco-innovation practices has been hyphotesized as follow:

H1: There is positive and significant relationship between stakeholder pressure and eco-innovation practices.

H1.1: There is positive and significant relationship between government pressure and eco-innovation practices.

H1.2: There is positive and significant relationship between societal pressure and eco-innovation practices.

H3.3: There is positive and significant relationship between industry pressure and eco-innovation practices

The literature review and the inputs from industry are integrated to compose the conceptual framework which illustrates a summary of possible relationships linked by arrows (see figure 1).

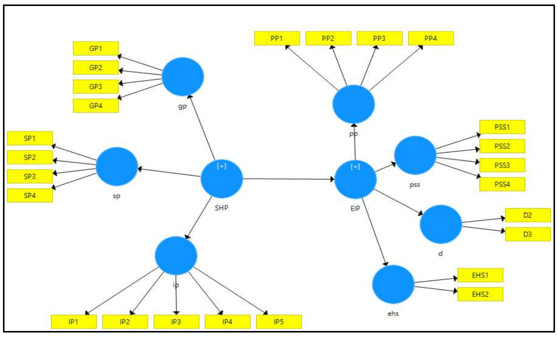

Fig. 1: conceptual framework.

Methodology:

The populations of this study consist of chemical companies in Malaysia. The sampling frame will be complying from the Federation of Malaysian Manufacturers (FMM) directory. The directory provides instant access to over 800 leading chemical manufacturers and suppliers in Malaysia. According to (Hair, Ringle, & Sarstedt, 2011), the required sample size should be determined by means of power analyses based on the model with the largest number of predictors. Alternatively, this study used the rules of thumb provided by Cohen (1992) as cited in (Hair *et al*., 2011) in his statistical power analyses for multiple regression model. For the purpose of data collection for this study, 500 questionnaires has been distributed to the various chemical companies, and 76 has returned the questionneires, resulted the response rate 15.2 percent. However, 3 questionnares need to discard as incompleted. Thus, this study collected 73 completed data samples from chemical companies, which is larger than 52, the minimum requirement of sample size.

Mailed and online survey has been used as the data collection method in this research. This method allows respondents to complete the questionnaire at their own time and convenience. Thus, respondents can take time to think and answer the questions and look for further information when necessary (Aaker and Day 1990; Emory and Cooper 1995). This study establishing content validity by conducting pre-tests and a pilot-test. For this study, the pre-test was done in two steps. First, a number of academician experts were approached for their opinions relating stakeholder pressure, eco-innovation, and the questionnaire design. Second, a pre-test survey was carried out with industrial experts from chemical to evaluate the measurement properties and the relationships specified in the structural model. The questionnaire was modified and refined before the data collection was carried out. The reliability of the measures was assessed based on the Cronbach alpha coefficient. As for this research, the reliability of the constructs range from 0.713 to 0.880; all within the acceptable range as described in (Wong, 2013; Hair, Ringle, & Sarstedt, 2011).

This study used structural equation modeling (SEM) implemented in partial least squares (PLS) for real data analysis. SEM analysis was chosen over regression analysis because SEM can be used to analyze all of the paths in one analysis. PLS is a latent structural equation modeling technique that utilizes a component-based approach to estimation. This technique provides the analysis of both a structural model (assessing relationships among theoretical constructs) and a measurement model (assessing the reliability and validity of measures). PLS is a desirable research tool because it requires a small number of samples and places less restrictive demands on residual distribution (Wong, 2013).

Findings And Discussion:

For PLS-SEM analysis purposes, Smart PLS 3.0 was used to analyze the measurement and structural models. Using Smart PLS the data was transformed into an Excel CVS file to generate raw input for the application.

Measurement Model Assessment:

The research model for this study is tested using partial least squares (PLS). Smart PLS 3.0 is used to assess the measurement and structural model for this study. This statistical program assesses the psychometric properties of the measurement model and estimates the parameters of the structural model. The validity and reliability of the measurement model for this study is evaluated using the following analyses: internal consistency reliability, indicator reliability, convergent validity and discriminant validity (refer Table 1). Table 1 shows all items in the measurement model exhibited loadings exceeding 0.500; ranging from a lower bound of 0.514 to an upper bound of 0. 894. Based on the results, all items used for this study have demonstrated satisfactory indicator reliability. Table 1 also shows that the CR of each construct for this study ranges from 0.799 to 0.89 and this is above the recommended threshold value of 0.7. Thus, the results indicate that the items

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used to represent the constructs have satisfactory internal consistency reliability. Convergent validity is adequate when constructs have an average variance extracted (AVE) value of at least 0.5 or more. Table 2 shows that all constructs have AVE ranging from 0.511 to 0.732, which exceeded the recommended threshold value of 0.5. This result shows that the study's measurement model has demonstrated an adequate convergent validity.

Table 1: Result summary of indicator reliability, internal consistency reliability and convergent validity.

Dimension	Item	Loadings	CR	AVE
Government Pressure	gp1	0.837	0.890	0.670
	gp2	0.848		
	gp3	0.838		
	gp4	0.746		
Soceital Pressure	sp1	0.813	0.859	0.608
	sp2	0.894		
	sp3	0.757		
	sp4	0.631		
Industry Pressure	ip1	0.802	0.852	0.538
	ip2	0.740		
	ip3	0.850		
	ip4	0.631		
	ip5	0.618		
Pollution Prevention	pp1	0.712	0.875	0.638
	pp2	0.801		
	pp3	0.873		
	pp4	0.799		
Product and process Stewardship	pss1	0.822	0.885	0.658
	pss2	0.810		
	pss3	0.841		
	pss4	0.772		
Distribution	d1	0.842	0.845	0.732
	d3	0.870		
Employee and public health and safety	ehs1	0.869	0.829	0.708
	ehs2	0.813		
2nd order Stakeholder Pressure (SHP)	Government Pressure	0.863	0.831	0.624
	Soceital Pressure	0.851		
	Industry Pressure	0.660		
2nd order Eco-Innovation Practices (EIP)	Pollution Prevention	0.847	0.799	0.511
	Product and process Stewardship	0.863		
	Distribution	0.514		
	Employee and public health and safety	0.565		

The measurement model's discriminant validity is assessed by using Fornell and Larcker's (1981) criterion (Hair *et al*., 2011). A measurement model has discriminant validity when the square root of the AVE exceeds the correlations between the measure and all other measures. The bolded elements in Table 2 represent the square roots of the AVE and non-bolded values represent the intercorrelation value between constructs. Based on Table 2, all off-diagonal elements are lower than square roots of AVE (bolded on the diagonal). Hence, the result confirmed that the Fornell and Larker's criterion is met.

Table 2: Fornell Larcker's Criterion.

	d	ehs	gp	inp	pp	pss	sp
d	0.856						
ehs	0.437	0.841					
gp	0.046	0.065	0.818				
inp	0.208	0.106	0.341	0.743			
pp	0.261	0.312	0.230	0.193	0.798		
pss	0.267	0.322	0.283	0.306	0.600	0.811	
sp	0.092	0.086	0.659	0.276	0.362	0.286	0.78

Structural Model:

The validity of the structural model is assessed using the coefficient of determination (R^2) and path coefficients. The R^2 value indicates the amount of variance in dependent variables that is explained by the independent variables. Thus, a larger R^2 value increases the predictive ability of the structural model. Referring to Figure 4.1, government pressure (gp), societal pressure (sp) and industry pressure (ip) are able to explain 20.7% of the variance (R^2) in eco-innovation practices (EIP).

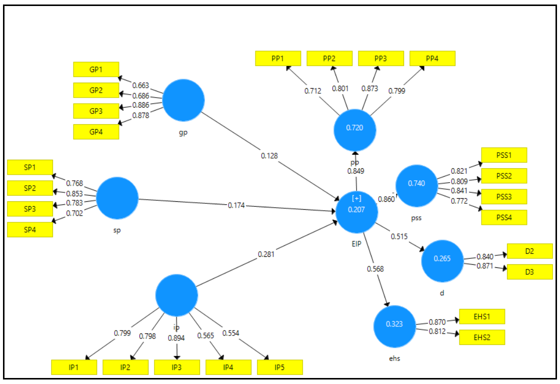

Fig. 4.1: Result of structural model.

Within the structural model, each path connecting two latent variables represented a hypothesis. Based on the analysis conducted on the structural model, it allows the researcher to confirm or disconfirm each hypothesis as well as understand the strength of the relationship between dependent and independent variables. In order to test the significant level, t-statistics for all paths are generated using the SmartPLS bootstrapping function. Based on the t-statistics output, the significant level of each relationship is determined. Table 4.3 lists down the path coefficients, observed tstatistics, and significance level for all hypothesised path.

Based on previous studies, the path coefficient value needs to be at least 0.1 to account for a certain impact within the model (Hair, Ringle, & Sarstedt, 2011; Wetzels, Odekerken-Schröder, & van Oppen, 2009). Assessment of the path coefficient (refer Table 3) shows that only proposed hypotheses 1 and 1.2 are supported. From the analysis, supported hypotheses are significant at least at the level of 0.05, have expected sign directions (i.e., positive) and consist of a path coefficient value (β) ranging from 0.126 to 0.390.

Table 3: Path Coefficients, Observed T- Statistics, Significant Level.

Hypothesis Paths	Path Coefficient (β)	Sample Mean (M)	SD	T Stat	P Values
SHP -> EIP	0.390	0.380	0.106	3.686	0.000
gp -> EIP	0.128	0.141	0.140	0.916	0.180
ip -> EIP	0.281	0.303	0.088	3.211	0.001
sp -> EIP	0.174	0.190	0.128	1.357	0.088

From the analysis, EIP is influenced directly by SHP (β=0.390, t=3.686, p<0.000) and ip(β=0.281, t=3.211, p<0.001). As a result, hypothesis H1 and H1.2 are supported. Among all the pressure indicator, industry pressure (β=0.281) is the most significant predictors in eco-innovation practices.

Conclusion:

The findings of this study reveal that stakeholder pressure (SHP) is an important antecedence in affecting eco-innovation practices. This variable concerns receiving pressure from government, especially local government, environmental and enforcement agencies, and national legislator will influence the extent of eco-innovation practices implementation. The results agree with the finding of (Wood & Wood, 2012;Yu & Ramanathan, 2015;Eiadat, Kelly, Roche, & Eyadat, 2008) that the total pressure exerted by different stakeholder groups (as perceived by firms) positively correlated with the level of activities or practices. Furthermore, industry pressure is the most significant predictors in explaining the eco-innovation practices.

This study contributes to the literature by introducing both the internal and external factors of stakeholder pressure in explaining eco-innovation practices. It is important for firms realize the importance and appropriateness in handling the stakeholder pressure especially industry pressure and adopting the eco-innovation practices. The R^2 value of 0.207 for EIP indicating that just 20.7 % of the variance are explained by the SHP indicators. This result shows that there are other indicators such as political, cultural and economical are not included in this study. In future research, all these factors should be taken into account. Moreover, the same research model proposed in present study can be applied to test the extent of eco-innovation practices in different organizations. By conducting this study, some other implications for organizations can be revealed.

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