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Research paper

Green supply chain practices, environmental management accounting and performance of ISO 14001 certified organizations

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Abstract

Globalization and growth of sustainability development have forced organisations to act comprehensively and sensitively towards environmental issues. In recent years, studies on Green Supply Chain Practices (GSCPs) and Environmental Management Accouting (EMA) have shown significant impact on Environmental Performance (ENP) and Economic Performance (ECP). Nevertheless, to date, no single framework is established to examine the implementation of GSCPs and EMA on ISO certified organisations. Specifically, how GSCPs are influencing the improvement in ENP and ECP and how the EMA information is used by ISO 14001 certified manufacturing organisations to induce cost saving benefits from the effect of positive environmental actions are yet to be determined. Thus, this study is inspired with the aims to bridge these gaps, by proposing a quantitative method to empirically test the hypotheses. A survey questionnaire is employed for the main data collection, targeted to examine the relationships within the constructs. A sample population is drawn from Malaysian ISO 14001 certified manufacturing organisations. The targeted respondents are the Environmental Management Representatives (EMR) who are responsible for maintaining and updating organisational environmental initiatives. This study uses the Structural Equation Modelling (SEM) to analyse the relationship encapsulated among GSCPs, EMA, ENP and ECP. This study is expected to provide a set of useful references generated for operational managers, supply chain managers, accountants, EMRs and practitioners to pursuit for an integration of EMA into existing EMS and GSCPs adoption. This is to enable the facilitation for organisations to achieve environmental sustainable development.

Keywords: *Green Supply Chain Practices; Environmental Management Accounting, Environmental Performance; Economic Performance; ISO 14001 Certified Organizations.*

1. Introduction

Malaysia, as a rapidly developing Asian country, is facing many tensions and doubts in environmental and corporate sustainability issues (Goh and Nabsiah, 2010; Ong et al., 2016). It is challenging for organisations to balance the increase in environmental concerns towards the industrialised economy in Malaysia.

The Eleventh Malaysia Plan (2016-2020) is breaking free from the conventional wisdom to develop green growth and to encourage the 3Rs, that are; Reduce, Reuse and Recycle. The Environmental Protection Expenditure Report (2015) further showed a total of RM2.244 billion spent on environmental protection. The Bank Negara Malaysia (DOSM, 2015) reported an increase of 0.3 % in environmental expenditure as compared to 2013. However, open-burning, black smoke emissions and water pollution are continuing the major environmental offenses committed by Malaysian organisations, reported by the Department of Environment (DOE) in 2016.

The waste disposal incidents have led to many arguments stating that organisations must move their businesses in a more environmental sustainable direction. The pollution problem could be minimized if organisations take in the environmental management system to properly and safely dispose of industrial waste (Eltayeb et al., 2011)

In recent years, Green Supply Chain Practices (GSCPs) have emerged as a set of procedures that reduce the sources of waste or pollution by using the life cycle assessment (Eltayeb et al., 2011; Abd Rahman et al, 2014). Hassan et al. (2016) contended that the implementation of the GSCPs benefits the ISO 14001 certified organisations by enhancing environmental responsibility and converting potential environmental threats into competitive opportunities or new businesses.

Malaysia is moving forward in becoming an industrialised economy (Eltayeb et al., 2011; Mokhtar et al., 2016). It is necessary for Malaysian ISO 14001 certified organisations to proactively adopt GSCPs to reduce sources of waste or pollution rather than to reduce environmental impacts after they have been created. Nevertheless, a lack of environmental information restricts organisations from being environmentally proactive (Eltayeb et al., 2009; Zailani et al., 2017).

Environmental Management Accounting (EMA) has emerged as one of the key mechanisms that addresses diverse aspects of environmental management from the ISO 14001 standards (Jalaludin et al., 2010; Jamil et al., 2015). Both of EMA's components; i.e., Monetary Environmental Management Accenting (MEMA) and

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Physical Environmental Management Accunting (PEMA) are widely accepted to help organisations identify, control, and improve their environmental and economic performance (Jalaludin et al., 2010; Jamil et al., 2015; Mokhtar et al., 2016).

However, Malaysian manufacturing organisations viewed EMA as a less significant strategic environmental management approach. It is perceived as cost intensive practices, rather than environmental management practices to support for cost saving initiatives (Ramli & Ismail, 2013; Mokhtar et al., 2016). Further, the uncertainty on the benefits of EMA hinders them from becoming an important component of environmental management practices (Jalaludin et al., 2011; Jamil et al., 2016). Study by Jamil et al., (2015) revealed manufacturing managers neither know nor participate much in EMA practices because of a lack of clear understanding of this practice.

Further, the MEMA and PEMA are yet to be placed and assigned accordingly to the comprehensive organisation's strategy into a coherent set of performance measures. The information-related barrier has hindered Malaysian manufacturers from implementing green practices due to the complexity in measuring environmental effects and transmitting environmental related information to all related parties (Wooi and Zailani, 2010; Shaharudin et al., 2015; Zailani et al., 2017).

As a developing country, Malaysia highlights economic development as a priority. The manufacturing sector has always been an important economic contributor for Malaysian gross domestic product (GDP). For year 2017, Malaysia's economy remained resilient at 5.6 percent (Q4 2016: 4.5%). The Department of Statistics (2017) has shown that the main contributors to the Malaysian GDP are the service sector with 54.2 percent and this is followed by the manufacturing sector with 22.8 percent. Manufacturing sector rose to 5.6 percent, a faster pace than 4.7 percent in the previous quarter which was spearheaded by Electrical, Electronic & Optical Products of 7.9 percent, mainly in production of printed circuit boards and semiconductors (DOSM, 2017).

Manufacturing sector is the major drivers of Malaysia economy. It is significant for balancing the environmental and economic performance when the demands of economic modernisation place competing demands on responsibility towards the environment. This study argues that the performance outcome of organisation's capabilities to minimise emissions, effluents and waste can lead to decrease in costs associated with the material purchased, energy consumption, and fines for environmental accidents.

Previous studies, however, reflect the lack of a comprehensive framework that includes GSCPs implementation, EMA information for environmental decision making and the evaluation of ENP and ECP. To extend the understanding and analysis of the interaction of GSCPs, EMA, ENP and ECP, leverage from GSCPs implementation and EMA beneficial analysis, this study investigates the relationship between GSCPs and EMA and the improvement of environmental and economic performance. The ultimate economic payback through cost saving measures is one of the important reasons that this study must continue to exploit and explore, particularly, ISO 14001 certified organisations in Malaysia.

The next section provides a brief literature on GSCPs and EMA studies and a discussion of the relationship between GSCPs, EMA, ENP and ECP towards environmental protection. The section is followed by an explanation of the research method employed in this study, and the hypotheses and conceptual model developed for this study. The significant of this study is presented in the last section.

2. Literature review

GSCPs are new, innovative management tools used to reduce waste and maximize environmental profit by adopting a life-cycle approach from the acquisition of raw materials up to the disposal of their product (Eltayeb et al., 2010, Zailani et al., 2012). The literature defined GSCPs as the whole application of green initiatives including the intra- and inter-organisational environmental practices cover from upstream to downstream (Green et al., 2012; Zhu et al., 2012) that focuses on environmental reduction collaboration and reciprocity (Khairani et al., 2016). The intra and inter-organizational integrations demonstrates the effectiveness of greening the supply chain to gain collaboration, commitment and competitive advantage in environmental protection (Cheng et al., 2008; Abd Rahman et al., 2014).

The number of GSCPs has developed with the aims to reduce environmental issues, of which include the internal environmental management system (IEM) emphasises on the internal waste management, green purchasing (GP) focuses on suppliers' environmental compliance, eco-design (ECO) focuses on designing products with environmental considerations and reverse logistics (RL) retains the recycle packaging for reuse and closes the supply chain loop. These GSCPs anticipate promoting efficiency and synergy between business partners to minimize wastage to enhance ENP and ECP (Green et al., 2012; Zailani et al., 2012; Zhu et al., 2012). ENP is related to the ability of an organization to reduce air emissions, waste water, solid waste, decrease their consumption of hazardous or toxic materials, decrease the frequency of environmental accidents, and improve their environmental situation (Shi et al., 2012; Zhu et al., 2012). ECP indicates the better use of organizational resources creating an advantageous position to simultaneously meet cost, quality, and performance goals (Zhu et al., 2012; Sarkis et al., 2011; Wong et al., 2012). The literature acknowledges the implementation of GSCPs which creates advantageous outcomes to improve ENP and ECP (Zhu et al., 2010; Green et al., 2012). Earlier studies have mainly focused on the direct relationships between ENP and ECP and the mediating relationships are limited in study. The underlying relationships that explain the improvement of ECP through the improvement of ENP leverage from the implementation of GSCPs have yet to be examined.

Previous literature has recognised the importance of environmentally informative systems that capture data to generate valuable resources to support managers in decisions making (Lopez-Valeiras et al., 2015; Ong et al., 2016). EMA information supports the organisational environmental management strategies through the process of identifying, collecting, controlling, and analysing by using information from both MEMA and PEMA (Jalaludin et al., 2010; Jamil et al., 2015). According to Mokhtar et al., (2015), EMA is a reliable source of information for its appropriateness in capturing environmental activities. Literatures have proven that EMA measures organisations' environmental performance and/or cost saving gained from the continuous improvement in environmental activities (Jamil et al., 2015; Khalid et al., 2015; Mokhtar et al., 2016).

Evidence from literature has revealed positive relationships between GSCPs-ECP and EMA-ECP (Green et al., 2012; Ong et al., 2016). Hence, this study argues that the ISO 14001 certified organisations with adoption of PEMA and MEMA are more likely to implement a higher extent of GSCPs and positive ENP which, in turn, maximise ECP via the improvement of ENP.

2.1. Natural resource based view theory

NRBV articulates the relationship between organisation's environmental resources, capabilities, and competitive advantage (Hart, 1995; Shi et al., 2012). It takes the perspectives that resources lead to the development of organisational capabilities (Barney, 1991). From the basic premises of NRBV, organisation's resources and capabilities perform superiorly in terms of cost saving which are the sources of competitive advantage.

Drawing from Natural Resource Based View (NRBV), improving ENP indicates the better use of organisational resources creating an advantageous position in terms of competitiveness and economic payback (Wong et al., 2012; Fraj et al., 2013). The environmental conscious initiatives such as GSCPs resulting from more complete processing, better utilisation of re-used products, and elimination of cost during waste-handling activities and con-

version of waste into valuable forms have a positive effect on ECP (Green et al., 2012; Khaksar et al., 2016).

According to Burritt and Shcaltegger, (2014), EMA provides information to enhance the interrelationship between supply chain partners and strengthen the collaboration for value creation that potentially shift investment from pollution control towards pollution prevention (Burritt and Schaltegger, 2014; Mokhtar et al., 2016). Literatures proved PEMA and MEMA support ISO 14001 certified organisations to better identify the activities that negatively impact the environment and positively improve the environment protection (Ramli and Ismail, 2013; Ong et al., 2016). Considering from the implementation of GSCPs and EMA, the organisations' collective resources that are rare, valuable and non-substitutable (Hart, 1995) are the sources of competitive advantage. The GSCPs-EMA-ENP-ECP postulates tacit resources to develop organisation's capability to take on the increasing challenges for effective and efficient environmental protection solutions along the supply chain.

In particular, this study examines the relationship between GSCPs and EMA as the primary factors influencing the ENP and ECP of the ISO 14001 certified organisations in Malaysia. The hypotheses addressed by this study are as follows:

H1: There is a direct and positive relationship between GSCPs and ENP.

H2: There is a direct and positive relationship between GSCPs and ECP.

H3: There is a direct and positive relationship between ENP and ECP.

H4: ENP mediates the relationship between GSCPs and ECP.

H5: Organisations that have adopted EMA are more likely to implement a higher extent of GSCPs and positive ENP than those that have not.

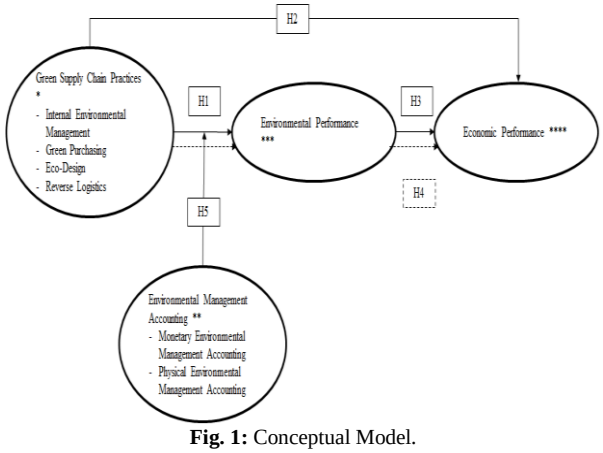

Fig. 1: Conceptual Model.

3. Methodology

A quantitative method was proposed to empirically test the hypotheses and a questionnaire survey is developed as the main data collection instrument to examine the relationship between constructs and its correspondence to the purpose and hypothesis of the study.

The sample population is drawn from Malaysian ISO 14001 certified manufacturing companies with three years registration duration. This primary criteria is to make sure the certified organisations have the ability to handle waste in accordance to the ISO 14001 standard. The ISO 14001 certified organisations which have prescribed the framework and guidelines to identify, document, control, monitor and assess environmental issues are expected to be equipped with environmental attributes to seek more comprehensive green initiatives within their operations and are more likely to adopt GSCPs and waste management practices (Darnall et al., 2008; Zhu et al., 2012). A list of ISO 14001 certified companies are obtained from the SIRIM QAS International Malaysian Certified directory (SIRIM, 2017).

The target respondents are the environmental management representatives (EMR) who are responsible for maintaining and updating certification authorities regarding any environmental progress made or environmental initiatives pursued by the company. This study plans to use the Structural Equation Modelling (SEM) to analyse the relationship between GSCPs, EMA, ENP and ECP. SEM is selected because it assesses the fit between the actual and estimated covariance matrices. Thus, to test the proposed model and the hypotheses of this study, SEM is the preferred method for data analysis for the relationship between GSCPs, EMA, ENP, and ECP.

4. Conclusion

This study seeks to add to the body of knowledge by providing a new mediating and moderating relationship and empirical insights on the current development of GSCPs, EMA, ENP and ECP. This study desires to provide operational managers, supply chain managers, accountant, EMR and practitioners the managerial and practical insights of how GSCPs and EMA act as the key strategic adoption practices to influence an organisation's ENP and ECP with an ultimate cost saving advantage.

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