



UNIVERSITI PUTRA MALAYSIA

***ENVIRONMENTAL STRATEGY, MANAGEMENT ACCOUNTING,
PROACTIVITY AND PERFORMANCE IN ISO14001-CERTIFIED
COMPANIES IN MALAYSIA***

JEYA SANTHINI APPANNAN

SPE 2021 29



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COMPANIES IN MALAYSIA**

By

JEYA SANTHINI APPANNAN

**Thesis Submitted to the School of Graduate Studies, Universiti Putra
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Doctor of Philosophy**

October 2020

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Doctor of Philosophy

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October 2020

Chairperson : Associate Professor Ridzwana Mohd Said, PhD
Faculty : School of Business and Economics

The world is facing a multitude of environmental problems, ranging from biodiversity loss, environmental pollution, deforestation and climate change. Many environmental problems are resulting from human activities that eventually either drive or trigger environmental catastrophes. Similarly, in Malaysia, environmental pollution is expected to become worse as the result of massive economic growth and rapid urbanisation. Given the overwhelming concerns on environmental issues, this study attempts to investigate the effect of environmental strategy, with a focus on important role of environmental management accounting on environmental performance. Additionally, this study also examines the moderating effect of environmental proactivity that was largely ignored in previous studies, on the relationship between environmental management accounting and environmental performance.

This study embedded both the theory of Natural Resource-Based View (NRBV) and Dynamic Capabilities (DC) in testing the link between environmental strategy, environmental management accounting, environmental proactivity, on environmental performance. The NRBV offers a connection between the natural environment with firms' resources and performances. On the other hand, theory of Dynamic Capabilities offers capabilities to enable firms to effectively initiate, search and execute and renew its innovative activities. In view of lack of empirical studies in this area, as well as to respond to calls of previous researchers, this study has employed important capabilities emerged from environmental management accounting and environmental proactivity to be integrated into the NRBV to enhance firms' environmental performance.

The target population consisted of ISO 14001 certified companies in Malaysia drawn from listing provided by SIRIM QAS International Sdn. Bhd. Systematic sampling method was applied. A total of 145 responses were collected from managers of ISO 14001 certified companies in Malaysia and the data was subjected to a structural equation analysis using Smart PLS version 3.2.7 software. This study found that the pollution prevention strategy and the clean technology strategy possess a significant positive relationship with environmental management accounting. Furthermore, the results of PLS-SEM revealed that environmental management accounting had a mediating relationship between pollution prevention strategy and clean technology with environmental performance. These findings indicate that environmental management accounting is a useful and important system in providing information to attain better environmental performance in Malaysia firms and the outcomes are also suitable for companies operating on other emerging countries in terms of developing capabilities to be able to manage EMA system and as a consequence, to improve environmental performance. Unfortunately, the findings failed to confirm any support for the argument that process stewardship influences environmental management accounting, nor does the environmental management accounting show its mediating effect on the relationship between process stewardship and environmental performance.

Additionally, this study also found that environmental proactivity positively moderates the relationship between environmental management accounting and environmental performance. This result seems to indicate that, high level of voluntary action in environmental proactivity together with its flexible capabilities will result in high use of environmental management accounting that plays an important role in determining a better firm's environmental performance. This findings further illustrate that ISO 14001 certified companies in Malaysia are now moving beyond meeting the basic regulatory requirement by engaging with EMA at more sophisticated level to improve environmental performance.

Furthermore, this study offers novel insights that extends the existing literature concerning the outcomes of environmental management accounting and environmental proactivity within the context of environmental management studies. To improve the generalization of the findings, future research should broaden the sample to non ISO 14001 certified companies in Malaysia. This paper also contributes to a deeper understanding that environmental management accounting requires increasing environmental knowledge and generating a wider conception of environmental management throughout organization, as such government agencies have to play a significant role in promoting environmental management accounting as well as encourage companies to engage more in environmental programmes in order to increase their level of proactivity.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

**STRATEGI ALAM SEKITAR, PERAKAUNAN PENGURUSAN,
PROAKTIVITI DAN PRESTASI SYARIKAT DISAHKAN ISO14001 DI
MALAYSIA**

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Terdapat pelbagai masalah persekitaran yang membelenggu dunia, seperti kehilangan biodiversiti, pencemaran alam sekitar, penebangan hutan dan perubahan iklim. Kebanyakan masalah persekitaran adalah disebabkan oleh aktiviti manusia yang akhirnya mendorong atau mencetuskan bencana alam sekitar. Begitu juga di Malaysia, pencemaran alam sekitar dijangka menjadi lebih teruk akibat pertumbuhan ekonomi dan proses pembangunan bandar yang pesat. Berikutan tumpuan mendalam yang diberikan terhadap isu alam sekitar, kajian ini berusaha untuk mengkaji pengaruh strategi alam sekitar, dengan memfokuskan peranan penting perakaunan pengurusan alam sekitar terhadap prestasi alam sekitar. Selain itu, kajian ini juga mengkaji kesan moderasi proaktiviti alam sekitar terhadap hubungan antara perakaunan pengurusan alam sekitar dan prestasi alam sekitar, dimana kajian terhadap kesan moderasi ini sebahagian besarnya telah diabaikan dalam kajian terdahulu.

Kajian ini merangkumi kedua-dua Teori Pandangan Berasaskan Sumber Asli (*NRBV*) dan Keupayaan Dinamik (*DC*) dalam mengkaji hubungan antara strategi alam sekitar, perakaunan pengurusan alam sekitar, serta proaktiviti alam sekitar, terhadap prestasi alam sekitar. Teori Pandangan Berasaskan Sumber Asli ini menghubungkan persekitaran semula jadi dengan sumber dan prestasi syarikat. Sebaliknya, teori Keupayaan Dinamik membolehkan syarikat berupaya untuk memulakan, membina dan melaksana serta memperbaharui aktiviti inovatifnya secara berkesan. Dengan mengambil kira kekurangan kajian empirikal dalam bidang ini, serta sebagai usaha untuk menyahut panggilan para penyelidik sebelum ini, kajian ini menggunakan kemampuan utama yang dikenalpasti daripada perakaunan pengurusan alam sekitar dan proaktiviti alam sekitar untuk digabungkan ke dalam Teori Pandangan Berasaskan Sumber Asli untuk meningkatkan prestasi alam sekitar syarikat.

Populasi sasaran terdiri daripada syarikat yang mempunyai pengiktirafan ISO 14001 di Malaysia yang ditapis daripada senarai yang disediakan oleh SIRIM QAS International Sdn. Bhd. Kaedah pensampelan sistematik telah digunakan. Sebanyak 145 maklum balas daripada pengurus syarikat diiktiraf ISO 14001 di Malaysia telah dikumpulkan dan data tersebut digunapakai untuk menjalankan analisis persamaan struktur menggunakan perisian Smart PLS versi 3.2.7. Kajian ini mendapati bahawa strategi pencegahan pencemaran dan strategi teknologi bersih mempunyai hubungan positif yang signifikan dengan perakaunan pengurusan alam sekitar. Di samping itu, hasil analisis PLS-SEM menunjukkan bahawa perakaunan pengurusan alam sekitar mempunyai hubungan mediasi antara strategi pencegahan pencemaran dan teknologi bersih dengan prestasi persekitaran. Penemuan ini menunjukkan bahawa perakaunan pengurusan alam sekitar adalah sistem yang berguna dan penting dalam memberi maklumat untuk mencapai prestasi alam sekitar yang lebih baik dalam syarikat di Malaysia dan hasil penemuan ini juga sesuai untuk syarikat-syarikat yang beroperasi di negara-negara membangun dari segi pengembangan kemampuan untuk menguruskan sistem perakaunan pengurusan alam sekitar dan seterusnya meningkatkan prestasi alam sekitar. Malangnya, penemuan ini gagal untuk mengesahkan sebarang sokongan terhadap hujah bahawa proses kolaborasi mempengaruhi perakaunan pengurusan alam sekitar. Perakaunan pengurusan alam sekitar juga tidak menunjukkan kesan perantaraan terhadap hubungan antara proses kolaborasi dan prestasi alam sekitar.

Selain itu, kajian ini juga mendapati bahawa terdapat kesan moderator positif proaktiviti alam sekitar terhadap hubungan antara perakaunan pengurusan alam sekitar dengan prestasi alam sekitar. Hasil ini menunjukkan bahawa, tahap voluntari yang tinggi dalam proaktiviti alam sekitar serta kemampuan voluntari yang fleksibel akan membawa kepada penggunaan perakaunan pengurusan alam sekitar yang tinggi yang memainkan peranan penting dalam menentukan prestasi alam sekitar syarikat yang lebih baik. Penemuan ini juga menggambarkan bahawa usaha syarikat diiktiraf ISO 14001 di Malaysia kini menjangkau keperluan memenuhi syarat peraturan asas dengan terlibat dalam perakaunan pengurusan alam sekitar pada tahap yang lebih memberangsangkan untuk meningkatkan prestasi alam sekitar.

Selanjutnya, kajian ini menawarkan wawasan baharu yang meluaskan literatur yang sedia ada mengenai hasil perakaunan pengurusan alam sekitar dan proaktiviti alam sekitar dalam konteks kajian pengurusan alam sekitar. Bagi meningkatkan generalisasi penemuan, penyelidikan pada masa depan harus memperluas sampel dengan merangkumi syarikat yang tidak diiktiraf oleh ISO 14001 di Malaysia. Di samping itu, kajian ini juga menyumbang kepada pemahaman yang lebih mendalam terhadap kenyataan bahawa perakaunan pengurusan alam sekitar mementingkan pengetahuan alam sekitar dan meluaskan lagi konsep pengurusan alam sekitar dalam seluruh organisasi. Oleh itu, agensi kerajaan haruslah memainkan peranan penting dalam mempromosi perakaunan pengurusan alam sekitar serta mendorong syarikat untuk lebih terlibat dalam program alam sekitar bagi meningkatkan tahap proaktiviti mereka.

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This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

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LIST OF ABBREVIATIONS

ABC	Activity Based Costing
BCa	Bias corrected and accelerated bootstrap confidence intervals
BoP	Base of Pyramid
CAT	Climate Action Tracker
CFA	Confirmatory Factor Analysis
CO ²	Carbon dioxide
CR	Composite reliability
CRED	Center for Research on the Epidemiology of Disasters
CT	Clean technology strategy
DC	Dynamic Capabilities
EMA	Environmental Management accounting
EP	Environmental performance
EPA	Environmental proactivity
EPI	Environmental performance index
GDP	Gross Domestic Product
IFAC	International Federation of Accountants
ISO	International Standard Organisation
LCA	Life Cycle Assessment
MEMA	Monetary environmental management accounting
MFCA	Material Flow Cost Accounting
MIDA	Malaysian Investment Development Authority
MITI	Ministry of International Trade and Industry
NRBV	Natural Resource Based View
OECD	Organisation for Economic Co-operation and Development
PEMA	Physical environmental management accounting
PLS-SEM	Partial Least Square Structural Equation Modelling
PPS	Pollution prevention strategy
PS	Process stewardship strategy
RDPA	Reactive, Defensive, Accommodative, and Proactive
SMEs	Small and Medium Enterprises
UK	United Kingdom
UN	United Nation
UNSD	United Nations Division for Sustainable Development
UPM	University Putra Malaysia
US	United States
VRIN	Valuable, rare, inimitable, and non-substitutable
WHO	World Health Organisation

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter consists of eight sections. The first section introduces the background of the study. The second section highlights the statement of problems in the present study. This is followed by the discussion of the research objectives and research questions of this study. The following section describes the significance and scope of the study, while the next section explains some of the important terms that were used throughout the thesis write up. This is subsequently followed by the organisation of the thesis. The summary provides an overview of chapter one.

1.2 Background of Study

1.2.1 Overview of Global Environment

Socio-environmental systems change dramatically, often in nonlinear direction and are difficult to predict. Surprises have become common in this environment. Scientists have discovered that the Antarctica's ice sheets are melting much quicker than expected (Konrad et al., 2018). Cod fisheries managers in Eastern Canada were surprised by both the collapse of fish stock in the early 1990s and by its failure in recovering stocks in spite of the closure (Filbee-Dexter et al., 2018). Another obvious phenomenon is in Western North America. Mountain pine beetle spread much faster damaging pine trees around the entire region (Filbee-Dexter et al., 2018).

The devastating rising level of carbon dioxide warms the planet, where scientists have warned that the hotter and drier climate will contribute to the increasing and intensifying of fires. This statement came to a pass when Australia experienced its biggest fires this summer that burned along the stretches of the eastern and southern coast, including areas surrounding Sydney and Adelaide (British Broadcasting Corporation News [BBC News], 2020). On top of that, from 2012 to 2016, drought in California has taken a massive environmental shock. These were the driest five years in the history of California that has had numerous impacts on the ecological, social and economic sector; including the widespread mortality of tree species (Swain et al., 2014; Robeson, 2015).

The Himalayas has begun to face an excessively hot weather, which has caused ice retreats, rainfall variations, and high-altitude glacial lakes in which have resulted in an increase of flash floods. The biggest regional catastrophe that occurred this century was the huge flash flood in 2013, which killed a large number of people across India of the Kedarnath valley in Uttarakhand (Das, 2013). Continuous anthropogenic pressure on natural resources have also led to an increase in the death toll from extreme heat events in countries such as Japan, Europe, and Canada in the year 2018 (Mehrabi et al., 2019).

Figure 1.1 shows that the world is now increasing in temperature and is nearing one degree warmer than before the industrial development took place. The World Meteorological Organisation stated that although one degree does not sound excessive, the world is still at risk of facing catastrophic changes, such as a rise in sea level, inability to grow crops, and many more if the countries fail to act (Mehrabi et al., 2019).

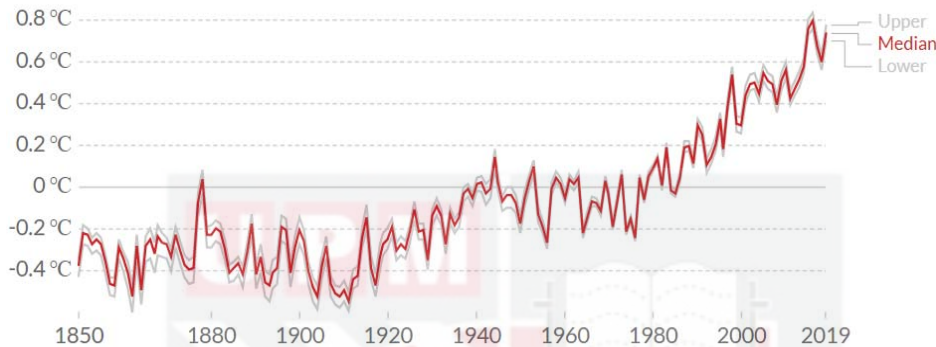


Figure 1.1: Global Average Temperature for the Year 1850 till 2019
(Source: Sustainable Development Goals Index Tracker (n.d.))

Consequently, a number of environmental laws has increased by 38-fold globally since the Stockholm declaration on the human environment in 1972 (Jackson, 2007). This involves the Durban Platform, Rio+20, and the Kyoto Protocol; which have stretched out to the year 2020 (United Nations Framework Convention on Climate Change [UNFCCC], 2017). Additionally, the Paris Agreement reaffirms the 2.0 degree goal, while urging further efforts to limit the increase to 1.5 degrees Celsius. Surprisingly, among the world's largest and most advanced economies, only two governments was recorded to meet the 1.5 degrees Celsius Paris Climate Agreement, They are Gambia and Morocco (Climate Action Tracker [CAT], n.d). The United States and China were insufficient to achieve the target, meanwhile India displayed a track to a 2.0 Celsius degree level (CAT, n.d). This clearly shows that we are still not prepared and have not found any toolkit to act globally in addressing the main issue. Thus, the World Health Organisation (WHO) and partners such as the United Nations Environment (UN) are developing ways to promote mutual understanding between humanity and nature.

Over a decade, the UN Secretary-General has invited all society to guarantee greater leadership; and secure more resources and thoughtful solutions for the Sustainable Development Goals (SDGs). The urgency clearly shows that the aim of regeneration and rejuvenation of nature could only be accomplished with the support of an active community involvement, especially on a corporate level.

1.2.2 Environmental Issues in Malaysia

Malaysia is situated along the Strait of Malacca and the South China Sea. It enjoys a warm tropical climate throughout the year. As Malaysia is located off the Pacific Ring of Fire geographically, it is relatively free from severe crises found in the neighbouring nations. Malaysia is, however, exposed to environmental vulnerabilities such as landslides, floods, forest fires, cyclonic storms, and tsunamis.

Malaysia has experienced fast industrial growth and urbanisation like other developing countries and has sought to become a fully developed country. Nevertheless, this economically beneficial production phase often polluted the environment. Based on the data collected by Center for Research on the Epidemiology of Disasters (CRED), Malaysia is reported to have been affected by multiple disaster events (Center for Research on the Epidemiology of Disasters [CRED], n.d).

According to Figure 1.2, Malaysia has experienced fifty-one natural disaster events in the past twenty years (Abdul Rahman, 2018). These were particularly bad in the year 2006, 2007, 2010, 2014, and 2017. In 2018, floods in the state of Northern Kelantan cost over 30 million Ringgit in damages (\$7.2 million). In December 2017, however, Penang spent approximately 34 million Ringgit on damages (Zuraini, 2018). The cost is projected to rise by 2030. Data also showed over 3 million people were affected due to natural disaster events, and damages caused nearly US\$2 billion (RM8 billion) in between 1998 to 2018 (Center for Excellence in Disaster Management and Humanitarian Assistance [CEDMHA], 2019). The largest quantity of carnage was caused by the floods in Malaysia, resulting in a total damage of US 1.4 billion (Zuraini, 2018). However, as shown in Figure 1.3, the death toll due to the natural disasters have reduced in the past twenty years in which we can comfortably conclude that Malaysia is developing a more proactive approach in finding ways and means to address the natural disasters in a holistic manner.

Efforts do not seem sufficient as the unpredictable weather in Malaysia contributes to a drop of 10 to 15 per cent farm yields per year (Povera, 2019). The trend could see more impairment in Malaysia's food security as more farmers are leaving their fields. Adding to this, the list of illnesses recorded due to the increase in pollution levels is the highest principal cause of hospitalisation (12.4 per cent of cases) and mortality (21 per cent) in Malaysia (Ministry of Health of Malaysia [MOH], 2019). Other lines of evidence also exhibit that Malaysian commuters that were exposed to the haze, face greater adverse health experiences (Chin et al., 2019).

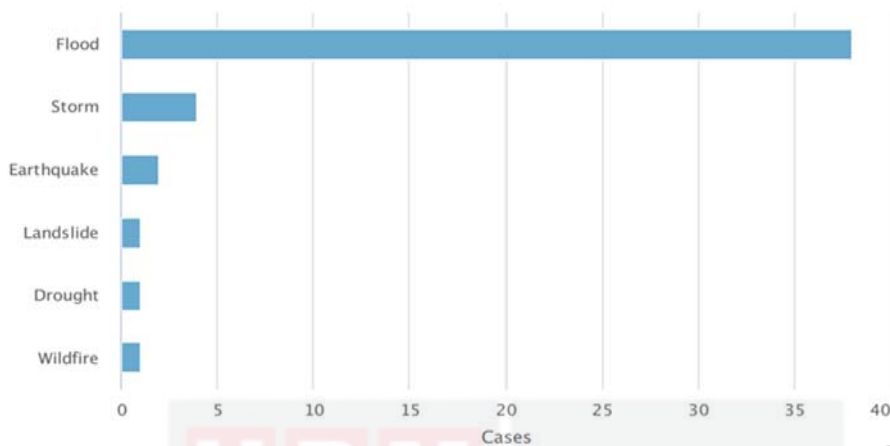


Figure 1.2: Types of Natural Disaster Affected from Year 1998 to 2018
(Source: Abdul Rahman, 2018)

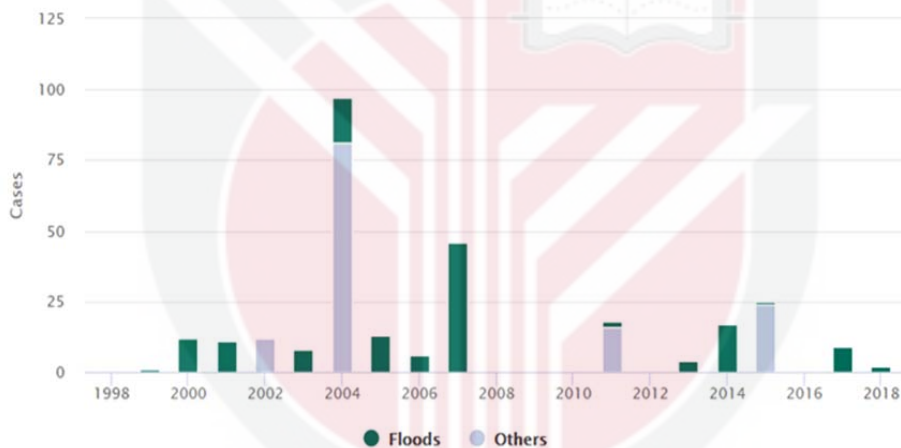


Figure 1.3: Death from Natural Disaster from Year 1998 to 2018
(Source: Abdul Rahman, 2018)

1.2.3 Malaysia's Effort to Build a 'Green Nation'

Malaysia is a middle-income nation as well as a multi-sector economy. The nation has developed several efforts to achieve the high-income status in 2020. Malaysia continues to increase domestic demands and limit export dependency in the country. This country is known as one of the ten main spots of rainforest in the world with biodiversity that exceeds Europe (Joseph, 2020). Hence, the nation holds a great responsibility to preserve its rainforest and wildlife.

As pledged in the Nationally Determined Contribution (NDC), Malaysia intends to reduce the emittance of greenhouse gasses (GHG) by 45 per cent by the year 2030, relative to its GDP intensity in 2005. This consists of 35 per cent on an unconditional basis and a further 10 per cent is conditional upon the receipt of climate finance, technology transfer, and capacity building from developed countries (Bernama, 2016). Malaysia reaffirmed its dedication at the 21st Conference of the Parties to the UNFCCC to maintain at least half of the country under forest cover (Joseph, 2020). There has been a considerable progress towards achieving these targets.

Given the condition that Malaysia is vulnerable to various environmental problems; the country outline of the 11th version of the Five-Year Plan (2016-2020) concentrates on enhancing disaster risk management through five phases; namely, prevention, mitigation, preparedness, response, and recovery (CEDMHA, 2019). Furthermore, the SDGs, which is also known as the "Global Goals," were fostered as the fundamental call for action to eliminate poverty, to protect the earth, and to assure peace and harmony for all by the year 2050 (United Nation [UN], 2015). To that end, Malaysia is committed and has adopted the 2030 Sustainable Development Agenda at the United Nations Summit in September 2015.

The 17 goals outlined under SDGs were: no poverty, zero hunger, good health and well-being, quality education, gender equality, clean water and sanitation, affordable and clean energy, decent work and economic growth, industry, innovation and infrastructure, reduced inequalities, sustainable cities and communities, responsible consumption and production, climate action, life below water, life on land, peace, justice and strong institutions, and finally goal number 17th is to draw on the partnership for the goals (UN, 2015).

Although multiple progress were made, ultimately, initiative to meet the objectives have not yet grown at the speed or scale required. It was also reported that the then Prime Minister, Tun Dr Mahathir Mohamad urged for deployment of new technologies as it is essential in achieving the SDGs. He noted that, if Malaysia were to move with the current speed of innovation, many opportunities and risks will go unrecognised. He, therefore, called for a rapid crystallise that are able to respond in a timely manner without depending only on regulators (Nor & Sarah, 2019). This shows that there is a demand for corporate to embed with the SDGs to reach these ambitious targets.

On the other hand, evolution of environmental policies shows the nation's commitment to increase the environmental quality. For example, Malaysia's embark on the Four Fuel Diversification Strategy has made great strides since the 1980s in terms of the renewable energy. The Kyoto Protocol was signed in 1997 and the Fifth Fuel Policy was signed in 1999 (Shaikh et al., 2017). Malaysia is devoted to the COP 15 to lessen its carbon emissions by 40 per cent and the nation made a pledge to lower its Greenhouse Gas (GHG) contribution to its Gross Domestic Product (GDP) by 45 per cent in 2030 as opposed to 2005 (Wan Abdullah et al., 2019). Moreover, a target of 20 per cent of electricity from renewable energy mix is to be reached by 2025 (Deloitte, n.d).

According to the Malaysian Investment Development Authority [MIDA] (2020), in the first six months of 2019, the country managed to attract a substantial amount of RM45.9 billion in the means of foreign direct investment. The government has taken an effective role in promoting Malaysia as an investment destination. One of the key trends that the country believes will continue to draw foreign investment into Malaysia is through green technology. For example, the Ministry of Finance's Green Technology Financing Scheme has constituted the "Green Growth Policy Accelerator" (Deloitte, n.d). Among the objectives are to communicate environmental goals and educate the public to foster understanding and commitment to pursue sustainability objectives, simultaneously standardise the emission or usage limits and the codes of conduct. More importantly, it encourages investments in efficient infrastructures, technology developments, and green public procurements that mobilises private capital for green growth.

The Small and Medium Enterprises (SMEs) account for between 88.8% and 99.9% of all ASEAN companies (Association of Southeast Asian Nations [ASEAN], 2018). Therefore, SMEs of South East Asia are recommended to scale up their efforts in initiating sustainable consumption and production to ensure more sustainable goods and services are available and mainstreamed throughout the region in the direction of the 2050 vision.

In order to advance businesses and factories in Malaysia, the Ministry of International Trade and Industry [MITI] (2018) proposed the National Industry Policy 4.0. Ideally, this will enhance efficiency, productivity, quality, and cultivate people with better skills and knowledge. Neighbouring countries like China, Japan, and Singapore have indeed progressed into Industry 4.0. These initiatives are known as "Smart Manufacture," "Made in China 2025" "Industrial Value Chain Initiative" and "Smart Nation Programme" (Wang et al., 2020). Computers are now connected and communicates with each other in the future as Industry 4.0 develops. This is to ensure that the ultimate decisions could be made without human participation.

However, the challenge now is to figure out how this broader context of 4.0 could be incorporated into sustainability agenda. Consequently, many companies are surviving in a complex and highly uncertain environment, resulting in navigation to uncharted areas. Amidst this uncertainty, the global community came together in a global call to guide all stakeholders; including business, in building a more sustainable, equitable, and inclusive society. Relatedly, an increasing number of tools are available to support companies and report their contributions towards the SDGs. Moreover, companies that invest in the provision of innovative solutions and transformative change were promised substantial economic benefits by the SDGs.

1.3 Problem Statement

Over the last few decades, the exploitation of our planet and the degradation of environment has gone up at an alarming rate. As human actions have been not in favor of protecting this planet, natural disasters befall humankind more often in the form of flash floods, earthquakes, blizzards, tsunamis, and cyclones. Specifically, in Malaysia, more than six percent increase in carbon dioxide (CO²) emissions are recorded annually, which is a concern for scholars and practitioners (Anwar et al., 2020). Besides, Malaysia is reported to have been affected by multiple disastrous events over the past decades. Ironically, the stringent environmental law enforcement no longer solves this issue. It is a glaring fact that there are yet any toolkit to act globally to address the main issue of the environment. Consequently, promoting environmental performance is an essential prerequisite to respond to global challenges (Kraus et al., 2020).

As shown in Figure 1.3, the death toll from natural disasters has reduced in this past twenty years in which we can comfortably conclude that Malaysia is taking great effort to move the country into a green nation status. Relatedly, a number of theories in extant literature have asserted a need to consider integrating environmental elements into development plan to achieve improved environmental performance, yet this does not seem to have fully reflected. This might be due to the fact that the progress remains slow, especially in developing countries.

Theoretically, it is asserted that environmental strategies are beneficial to improve environmental performance (Hart, 1995; Hart & Dowell, 2011). However, to successfully adopt green strategies is often a challenging task, particularly when firms were constrained by their limited resources and capabilities (Wu & Pagell, 2011). As such, debates have not been laid to rest despite the fact that substantial work had been done in the extant literature on environmental performance. Many companies are still struggling to get it right and to define their next steps in aligning their strategies to measure and manage their carbon footprints (Pedersen, 2018). This struggle has offered an inconsistent conclusion in the environmental management literature. This could also be explained with, the Malaysia's Environmental Performance Index (EPI) which was ranked at the 64th place in the year 2016 and has fallen down to the position of 75th in the year 2018 (Environmental Performance Index, 2018). This has led to a possibility that the linear relationship with strategy and performance may not yield further benefit to environmental performance.

Due to the paucity in both practical and theoretical gaps in literature, this study suggests the corporate environmental strategy to be examined with the use of EMA; a system that records, analyse, and report environmentally-induced financial and ecological impacts of a defined economic system (Burritt & Saka, 2006). EMA, which constitutes the theory of Dynamic Capabilities (DC) is expected to have the capability to embrace more environmentally-friendly behaviours within an organisation (Spencer et al., 2013). This may help the employees to acquire new knowledge and seize the capability to engage employees in innovation-related activities. In turn, this would transform the business system to avoid wastage and ease the process of achieving good environmental performance (Bartolomeo et al., 2010). Therefore, this study would investigate the linear

relationship between the environmental strategy drawn from the theory of Natural Resource Based View (NRBV), and EMA drawn from the theory of DC. Due to the lack of empirical studies in the past in examining the environmental strategy explicitly, this study, therefore proposed the link between pollution prevention strategy, process stewardship strategy and clean technology strategy on EMA.

Besides that, it is surprising to note that despite success stories of the use of EMA in the western countries, Ariffin (2016), Mokhtar et al. (2016) and Jalaludin et al. (2011) found that companies in Malaysia are less responsive towards EMA. This study is of the impression that the ISO 14001 certified companies in Malaysia in particular should maximise their utilisation of EMA in order to achieve an improved performance. This is due to the fact that transition to ISO 14001 significantly moves the company's direction from protection to prevention activities by aiming to turn their wastes to good use which requires a high level of environmental proactive approach. Moreover, integration of EMA tools into ISO 14051 (International Organization for Standardization [ISO], 2011) has increased the need for organisations to trace and quantify monetary and non-monetary flows to produce a low-carbon transaction in their supply chain management. Hence, this study would like to employ EMA as a role of mediator between the relationship of environmental strategy and environmental performance. Finally, there are companies that are seeking to create green products due to market needs by establishing positive brand images and social responsibilities in order to gain social support (Chen, 2009). In view of this, the business world currently faces another major issue, which is greenwashing. 'Greenwashing' is defined as intentionally claiming that the firm's products or processes are environmentally friendly, when they are often not (Nyilasy et al., 2014). For this reason, we are nowhere towards acquiring a sustainable world.

In view of this, this study also sees environmental proactivity as a moderator with the ability to moderate the effects of EMA on environmental performance. There are not many studies that assess the indirect influence of environmental proactivity on EMA and performance. This is, therefore, an important consideration since companies may pretend to be 'proactive' in their environmental endeavours, but a lack of fundamental attention to the environmental concerns may adversely affect that claim. In lieu of limiting greenwashing issues and shedding light on the relationship between what firms perceives they are doing and what they are actually doing in practice, with both espoused and actual practices; this study would like to employ environmental proactivity as a moderator to analyse the situation better.

According to Burritt et al. (2011), EMA can play a decisive managerial role in helping managers. Theoretically, however, EMA needs to be studied broadly to discover the ways this tool can highly influence the environmental performance. Besides that, environmental proactivity role is expected to possess the potentials to find ways to boost the use of EMA and improve environmental performance. In conclusion, this study offers a viewpoint on assessing various combinations of conditions (paths) that leads and explores factors essential to corporate players to get closer to the sustainable development goals.

1.4 Research Questions (RQ)

The main RQ is “What are the pathways for ISO 14001 companies to realise superior environmental performance from their implementation of environmental strategies?” Specific research questions addressed in this study are as follows:

RQ 1: Does environmental strategies (pollution prevention strategy, process stewardships strategy, and clean technology strategy) affect environmental management accounting?

RQ 2: Does environmental management accounting affect environmental performance?

RQ 3: Does the mediating role of environment management accounting affect environmental strategies and environmental performance?

RQ 4: Does the moderating role of environmental proactivity affect environmental management accounting and environmental performance?

1.5 Research Objectives (RO)

The general objective of this study is to examine the relationships between environmental strategies, environmental management accounting, environmental proactivity and environmental performance in selected ISO 14001 certified companies in Malaysia. Specifically, objectives of the study are:

RO 1: To investigate the effect of environmental strategies (pollution prevention strategy, process stewardships strategy, and clean technology strategy) on environmental management accounting.

RO 2: To investigate the relationship between environmental management accounting and environmental performance.

RO 3: To examine the mediating role of environment management accounting in the relationship between environmental strategies and environmental performance.

RO 4: To examine the moderating role of environmental proactivity in the relationship between environmental management accounting and environmental performance.

1.6 Significance of the Study

This research offers a significant contribution to the body of knowledge through a comprehensive framework on environmental performance. The research is derived from the integration of Theory of Natural Resource Based View (NRBV) (Hart, 1995), and the Dynamic Capability (DC) Theory (Teece, 1997).

This is among the earliest research that focuses on environmental strategy namely, pollution prevention strategy, process stewardship strategy and clean technology strategy as the predictors of environmental management accounting (EMA). Therefore, all instruments used in this research have been adapted, measured and validated within the context of Malaysian companies.

This research also makes an effort to explore the role of EMA as a variable that mediates the relationship between environmental strategy and environmental performance. Empirical findings from this study could provide a new viewpoint as the most relevant aid for the companies to manage their environmental performance through its specific capabilities of sensing, analysing and communicating. The inclusion of this dimension certainly provides an extension of knowledge to compliment the previous researches that examined environmental performance.

Moreover, this research is apparently one of the first few attempts that integrates environmental proactivity as a moderator between EMA and environmental performance. Environmental proactivity assist many businesses in their effort to deploy and exploit the company's resources and capabilities in accomplishing uniqueness in the business model. In this regard, this study shed light on the relationship between what firms' think they do and what they actually do in practice. The outcome of this study is also expected to reduce and prevent the diffusion of greenwashing.

1.7 Motivations of the Study

Firstly, this study expects environmental strategies to enhance the use of EMA by utilising the existing theory of NRBV. Previous studies tried to comprehend one of the two sets of environmental strategy derived from the theory of NRBV. For example, past researchers were focusing on the subject of pollution prevention and stewardship. In response to this, this study pushes further and tests all three main strategies introduced by the NRBV; namely, pollution prevention, product stewardship, and clean technology (Hart & Dowell, 2011). These interrelated strategies are also known as a pro-active initiative towards the environment (Hart, 1995; Hart & Dowell, 2011), yet, the link between clean technology strategy and process stewardship strategy do not seem to be widely tested in the past literature. Due to the rising of man-made environmental disasters, this study is motivated to examine thoroughly all three strategies on environmental performance.

In addition, there is often an acute need to replace existing technologies with state-of-the-art new technology. The twenty-first century economy will rely on the adoption of technology for long-term sustainable growth, as well as on the support of the Industry 4.0 revolution. Hence, there is a prompt need of quick detection and prevention. This study proposes clean technology strategy to yield superior environmental performance.

Secondly, there has been a rising concern that EMA is under-researched (Doorasamy, 2015). Bebbington and Larrinaga (2014) noted a lack of effort in social and

environmental accounting towards sustainable development. The authors, therefore proposed that the environmental researches need to incorporate more accounting knowledge and tools for effective ecosystem management. On the other hand, there were evident studies to exhibit that EMA were widely accepted in various sectors and industries such as automobiles (Jasch & Lavicka, 2006); iron and steel (Zhou et al., 2017); local government (Burritt & Saka, 2006; Qian et al., 2011); pulp and paper (Gale, 2006a; Setthasakko, 2010); and manufacturing (Jalaludin et al., 2010). Despite the large degree of acceptance as was found in Malaysia, these tools were not being taken advantage of by the companies (Ariffin, 2016). This study is inspired by the low adoption of these tools by the Malaysian companies (Muhammad Jamil et al., 2015) and would like to explore on the further barriers that were raised by its implementation. This study wishes to shed some light on the benefits of EMA.

Thirdly, environmental proactivity in existing literature remains ambiguous. Gonzalez-Benito and Gonzalez-Benito (2005) revealed that some dimensions of environmental proactivity reflected both positive and negative effects on performance. Nevertheless, the studies reviewed seldom explains the indirect effect of environmental proactivity towards performance for the benefit of future researches. This, therefore, motivates this study to identify possible areas where environmental proactivity can be used for future research paths.

1.8 Scope of the Study

Numerous studies have shown that businesses can harvest some benefits by adopting the ISO 14001, such as stimulating their competitiveness (Iatridis & Kesidou, 2016); improving corporate reputation (Jiang & Bansal, 2003); increases stakeholders' management (Heras-Saizarbitoria & Boiral, 2013) upsurge company's performance (Ong et al., 2016); and cultivating corporate sustainability (Iatridis & Kesidou, 2016). In addition, it was supported statistically that by the year 2011, nearly a 56 per cent increase over the previous five years had certified their operation to ISO 14001 (Ferrón Vílchez, 2017). However, the nation is yet to see convincing approaches in environmental performance improvements.

Thus, this study will examine the relationship between environmental strategies as outlined in the theory of NRBV and environmental performance' with the presence of EMA and environmental proactivity. The data for this study, therefore, were collected from the ISO 14001 companies as provided by SIRIM QAS International Sdn. Bhd.

1.9 Definition of Terms

The following terms are defined in the context of the study:

1.9.1 Environmental Strategies

Conceptual definition

Set of initiatives that minimise the ecological footprint of the business operations through their products, processes, and corporate policies (Bansal & Roth, 2000).

Operational definition

A series of proactive initiatives (pollution prevention, stewardship, and sustainable development) that reduces negative impact on the environment and benefits a firm.

1.9.2 Pollution Prevention Strategy

Conceptual definition

Refers to the use of materials, processes that reduce or eliminate the creation of pollutants or wastes at the source (Freeman et al., 1992).

Operational definition

Initiative of companies to avoid harmful pollutants by creating a competitive advantage before they were created, instead of cleaning them up by the end of the pipe.

1.9.3 Process Stewardship Strategy

Conceptual definition

This strategy is implemented through the different stages of the supply chain and requires a level of engagement with the key stakeholder groups such as suppliers and customers (Wong et al., 2012; Mena et al., 2014).

Operational definition

Supplier environmental collaboration: Referred to activities that aim to improve environmental performance and capabilities of suppliers at undertaking joint projects for the development of green products and innovations (Canning & Hanmer-Lloyd, 2001; Vachon & Klassen, 2006a).

Customer environmental collaboration: Referred to activities that aim to improve environmental performance and capabilities of customer at undertaking joint projects for the development of green products and innovations (Canning & Hanmer-Lloyd, 2001; Vachon & Klassen, 2006a).

1.9.4 Clean Technology Strategy

Conceptual definition

Clean technology is making a disruptive change using the innovative technologies into the company's existing products and process design so they can benefit from the future market opportunities (Masoumik et al., 2015).

Operational definition

As a disruptive technology that uproots an established technology, or a revolutionary product or service that spawns a new industry.

1.9.5 Environmental Management Accounting

Conceptual definition

The identification, collection, and analysis of two types of information (monetary and non-monetary) for internal decision-making (International Federation of Accountants [IFAC], 2005, p. 19).

Operational definition

A system that associates with decision-making and relates to sustainable development with two kinds of information (monetary and non-monetary).

1.9.6 Environmental Proactivity

Conceptual definition

A voluntary effort that goes beyond the compliance which company pursues to minimise or eliminate the environmental damages that arise from its activities (Menguc & Ozanne, 2005).

Operational definition

Voluntary engagement with the environment is pursued to minimise and avoid the phenomenon of undesired results.

1.9.7 Environmental Performance

Conceptual definition

Reflection on how far the firm processes and practices maximise resource efficiency, reduce waste, and reduce the environmental risks (Roberts & Gehrke, 1996).

Operational definition

Reflection on how far firm strategy processes and practices optimise resource efficiency, reduce waste, and reduce environmental risks.

1.10 Organisation of Chapters

The organisations of the following chapters are as follows:

Chapter Two: Literature Review– This chapter reviews the prior literature. It summarises topical outcomes of what was documented earlier in regards to the scope of the study. Secondly, it analyses the gaps arose in the works of literature reviewed.

Chapter Three: Hypotheses Development – Drawing on the Natural Resource Based View Theory and Dynamic Capabilities Theory, several hypotheses were developed, introducing perceptual variables derived from the literature reviewed.

Chapter Four: Research Methodology – This chapter provides a discussion on the epistemic position of the researcher from which the research design of the present study is shaped. This chapter also describes development of survey instruments, procedures for data collection and choice of statistical tools for data analysis.

Chapter Five: Results and Discussions –This chapter presents findings of data analysis on sample data collected from ISO 14001 companies in Malaysia by using SmartPLS software and SPSS. This chapter outlines measurement model analysis, structural model analysis, hypotheses testing and discussion of the findings.

Chapter Six: Conclusions, Implications and Recommendations – This chapter concludes the thesis by summarising the objectives, main findings, and discusses limitations, the significant implications of the present study and suggestions for future researchers.

1.11 Chapter Summary

This chapter outlines the current research background, the problem statement, research objectives and research questions, followed by the significance of the study, the scope of the study, and finally the definition of the terms.

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