

Environmental Management System and Financial Performance

Tze San Ong^a, Boon Heng Teh^b, Sin Huei Ng^c, Wei Ni Soh^d

Abstract: *The paper aims to explore the relationship between ISO 14001 certification and a company's financial performance to investigate whether the certification to ISO 14001 environmental management standard has benefited the company's financial performance or not. Using Malaysia as the research context, the results of a linear regression analysis show that firms with above-average performance have a greater tendency to pursue ISO 14001 certification. The findings also indicate that there is a significant relationship between ISO14001 certification and a company's financial performance in an emerging economy context. The reason is the adoption of ISO 14001 standard does offers many benefits to companies, such as greater reputation and brand awareness on one hand, and higher sales and investors' confidence on the other. The ISO 14001 certification helps to develop a better system which leads to costs reduction and revenue increase in the long run.*

Keywords: Environmental management system, ISO 14001, Malaysia, return on assets, return on equity

JEL classification: G34, M14, M41

Article received: 29 January 2015; Article Accepted: 25 February 2016

1. Introduction

The responsibility of modern accounting is not only to keep transactions records but also to report on any relevant information to its internal and external shareholders for better decision making. Since sustainability and green environmental issues have entered into the accounting picture over the past few decades, a new trend in accounting was invented known as

^a Corresponding Author. Department of Accounting and Finance, Faculty of Economics and Management, Universiti Putra Malaysia, 43400 Serdang, Selangor, Malaysia. Email: tzesan@upm.edu.my/tzesan1108@gmail.com

^b Unit Finance, Faculty of Management, Multimedia University, Persiaran Multimedia, 63100 Cyberjaya, Selangor, Malaysia, Cyberjaya, Selangor. Email: bhteh@mmu.edu.my

^c INTI International University, Persiaran Perdana BBN, Putra Nilai, 71800 Nilai, Negeri Sembilan. Email: sinhuei.ng@newinti.edu.my

^d Department of Accounting and Finance, Faculty of Economics and Management, Universiti Putra Malaysia, 43300 Serdang, Selangor. Email: sohweini@yahoo.com

“Environmental Management Accounting” (also known as green accounting).

Environmental Management Accounting (EMA) by definition, is the provision and analysis of both financial and non-financial information to support internal environmental management processes (Shane, 2004). However, there is still no consensus in the terminology used associated with EMA (Burritt, 2001). In order to develop and implement an efficient and effective EMA, companies should consider three of the following questions:

- a) What are the significant issues relevant to the environment?
- b) Where does the environment entity want to use the cost associations to quantify environmental issues?
- c) What are the relevant data that should be collected?

(Vasile & Man, 2012).

However, environmental issue considerations should be defined and mandated by a globally recognised organisation. The ISO (International Organization for Standardization) is the world’s largest developer of Voluntary International Standards which is well known for its international management standards for quality assurance in a broad range of business and industrial applications.

The ISO, founded in the year 1947, aims to facilitate the international coordination and unification of industrial standards. The International Organization for Standardization has different acronyms in different languages (IOS in English, OIN in French for *Organisation internationale de normalisation*). Therefore, in order to standardise the concept among different countries and languages, the founders decided to name it as ISO which is derived from the Greek term ‘isos’, meaning equal.

The ISO 14001 family addresses various aspects of environmental management. It provides practical tools for companies and organisations who intend to identify and control their environmental impact while wanting to constantly improve their environmental performance. The ISO 14001 Environmental Management System standard is an internationally recognised standard for the development of an effective EMS. The ISO 14001:2004 and ISO 14004:2004 in particular focus on environmental management systems.

The ISO 14001 is the world’s most recognised framework in establishing environmental management. It helps companies to account for the impact of their activities on the environment and also to demonstrate sound environmental management. The ISO 14001 has been adopted as a national standard by more than 100 countries around the world. Although certification of conformity to the standard is not a requirement of ISO 14001, until the end of 2007 at least 154,572 certificates had been issued in 148 countries and economies. This shows the increased global commitments and

awareness of the corporations and countries toward better environmental management.

Evidences of developing environmental management are seen in emerging countries like Malaysia as well. According to the Ministry of the Environment in Malaysia, environmental management accounting (EMA) objectives are to: achieve sustainable development; maintain a favourable relationship within the community; and pursue effective and efficient environmental conservation activities. During the past decade in Malaysia, the number of companies engaging in a rudimentary form of social and environmental reporting has been on the rise (Environmental Resources Management Malaysia [ERM], 2002; ACCA, 2004). However, it is still not clear how the integration of EMA has affected the financial performance of companies in Malaysia. Hence, this study aims to discover the possible influence of ISO 14001 adoption, as an evidence of EMA implementation, on the financial performance of public listed companies in an emerging market like Malaysia.

Commitment to the environment has attracted a lot of attention within current competitive scenarios. The global profile of environmental issues has risen significantly during the past two decades, precipitated in part by major incidents such as the Bhopal chemical leak in 1984 in India and the Exxon Valdez oil spill in 1989 in Alaska (Shane, 2010). As a result of these environmental disasters, there have been a lot of arguments about where companies should move their business towards a more sustainable direction.

However, it is still unclear how environmental practices affect a company's financial performance. Some researchers like Stanwick and Stanwick (1998) argued that environmental activities do not contribute to the financial performance while King and Lenox (2001) found that implementing environmental practices positively improve financial performance. Since energy efficiency and costs are highly related to operating costs, the financial performance is directly affected (Cusack, 2008). McWilliams and Siegel (2001) argued the existence of a neutral relationship between social and financial performance. It must be noted that after more than three decades of conducting both theoretical and empirical researches, the nature of the relationship between environmental and financial performance still appears inconclusive (Konar & Cohen, 2001; Wagner, 2001; Teh, Chong, Yeap, & Ong, 2012; Ong, Teh & Ang, 2014).

The EMA seems to be a new trend in the current accounting practice throughout the world on the grounds of the fact that a variety of environmental issues have been scrutinised by different researchers including proposed framework of EMA by Burritt, Hahn and Schaltegger (2001), environment-related management accounting pyramid by Bennett and James (1998A), input/output analysis by Envirowise (2003), and basic idea of flow cost accounting by UNDSO (2003). Although there are many

studies on EMA, the debate is still ongoing whether implementing environmental management accounting is adding value to companies' financial performance or it is just a fad that everyone pursues. Companies must be responsible to stakeholders, yet it is still unclear how far they have met the bottom line expectations of their stakeholders (McPeak & Dai, 2011). Hence, researches such as Stuart (2000), Salama (2005), and Lo, Yeung and Cheng (2012) were motivated to study the impact of environmental management accounting on companies' financial performance. In addition, firm initiatives in implementing environmental management accounting may benefit the company in terms of financial performance such as cost saving (Melnyk, Sroufe, & Calantone, 2003).

However, many companies are still not convinced by the benefits of environmental accounting, especially small medium enterprises (SMEs). Prior research found that companies in environmentally sensitive industries tend to disclose their environmental information via corporate annual reports (Raar, 2002). According to a study by Sumiani, Haslinda, and Lehman (2007), Malaysian companies' engagement with strategic environmental movements has substantially improved. Despite these findings, the culture of reporting environmental considerations in Malaysia is still in its infancy in terms of its contents and descriptive analysis, compared to the ones in developed countries.

In addition, there are many studies that have solely analysed positive benefits attributed to the certification to ISO 14001, as an evidence of observing EMA practices. Examples of these can be seen in the studies by Poksinska, Jörn Dahlgaard, and Eklund, 2003, Zutshi and Sohal, 2004, and Gavronski, Ferrer, and Paiva, 2008. However, these studies were conducted over a small scale or they were rated based on managers' personal judgement about performance improvement. Because these managers have put a lot of effort on the implementation processes of the environmental management system within their organisations, their judgments are not free from personal bias. Studies such as Wayhan and Balderson (2007), Nowrocka and Parker (2009), and Heras-Saizarbitoria, Molina-Azorin and Dick (2011) have referred to the existence of these biases in managers' EMA reports. Therefore, this study follows the above-mentioned authors' recommendation to use financial performance as a measurement variable of ISO 14001 certification outcomes.

Malaysia, as a rapidly developing country in Asia, may face a lot of tensions and doubts in environmental and corporate sustainability issues (Sumiani et al., 2007). Many companies, especially small-medium enterprises (SMEs), questioning whether there is a relationship between financial performance and environmental performance. The rapid rates of modernisation and urbanisation in Malaysia raise concern about environmental issues. Deforestation, mining, land development, construction

and other industrial developments have been carried out in large scale in recent years which have raised significant concerns about environmental issues. Here is where the question on factories and organisations compliance with the environmental protection law has been asked by the Malaysian government and NGOs, such as the case of Lynas. Therefore, it is indispensable to investigate the study gap in the relationship between environmental management accounting with ISO 14001 certification and company's financial performance in the Malaysian context. The main objective of this study is to find out the relationship between ISO 14001 certifications and financial performance of Malaysian listed companies.

2. Environmental Management Accounting (EMA)

The EMA is defined as the process of identification, collection, calculation (estimation), analysis, internal reporting and use of cost information regarding materials and energy, and environmental costs within the decision process so as to adopt convenient decisions capable of contributing to environmental protection (Vasile & Man, 2012).

Environmental Management Accounting (EMA) brings a lot of benefits for organisations. The EMA provides companies with the true environmental costs estimations while it supports managerial decision making with regard to capital investment, costing determinations, process/product design, performance evaluations, and other business related decisions.

The objective of EMA is to generate and analyse of both financial and non-financial information in order to support internal environmental management processes. In addition, it is a complementary tool for the conventional financial management approach to develop appropriate mechanisms which assist the identification and allocation of environment-related costs (Bennett & James, 1998; Frost & Wilmhurst, 2000; Johnson, 2004).

Moreover, EMA, offers a combined approach whereby data is extracted from financial accounting, cost accounting and material flow balances in order to increase material efficiency, reduce environmental impact and risk, and reduce costs of environmental protection (Jasch, 2003). Overall, due to the increasing global awareness of green environment, EMA as a new accounting approach is developed. development.

2.1 Evolution of EMA

In order to fill in the gap between environmental issues and accounting practices, the US Environmental Protection Agency was the first national agency to set up a formal programme to promote the adoption of EMA in the

early 1990s (Jasch, 2006). Since then, there have been many environmentally-related management initiatives being developed and implemented. However, these interests were categorised by the Working Group on EMA of United Nations Division for Sustainable Development (UN DSD EMA WG). Later, the International Federation of Accountants (IFAC, 1998) developed a guidance document on EMA based on the publications by UN DSD EMA WG.

The aim of the guidance was to reduce some of the conflicts and confusions on this new accounting tool by providing a general framework and a set of definitions. According to Jasch (2006), EMA is the next step in the evolution of management accounting. Traditional Management Accounting (MA) has always focused on monetary and non-monetary items. The IFAC had outlined the evolution of MA over time in four stages with four different focuses, which are listed as below:

Stage 1 (pre 1950) – cost determination and financial control;

Stage 2 (by 1965) – information provision for management planning and control;

Stage 3 (by 1985) - waste reduction of resources in business processes; and

Stage 4 (by 1995) – creation of value through effective resources use.

In general, the focus of IFAC on MA had moved from monetary to non-monetary (i.e., stage 1 to 2) and also from reduction of waste to generation of value (i.e., stage 3 to 4). Although EMA is a new accounting tool, the MA goals which are listed as above has been used by EMA. Besides, focusing on resource productivity in stage 3 and 4 corresponds with the EMA's focus on accounting for the flows of natural resources. In addition, EMA also has a strong hub on the Stage 1 and 2 which are goals of cost determination, financial control and information provision. Nevertheless, EMA is still continuing to improve and evolve, which is on the same track with the evolution of MA towards the resource productivity and value creation activities for which EMA data are well suited.

2.2 The importance of EMA

The main objective of environmental management accounting is to provide reliable data and information to be used in analysis, estimation and reporting for the purpose of decision making about environmental costs. Vasile and Man (2012) have examined the environmental management accounting in the aspect of its implementation and operationalisation. They classified the

environmental costs into environmental protection expenditures and waste costs. Environmental protection expenditure covers all the costs that will incur in order to protect, prevent, and control the environment. Whereas, waste costs imply double meaning: material losses during the technological and operational flows and also inefficiency of the technologies.

The EMA which integrates two of the main principles of sustainable development – environment and economics - can significantly improve corporate decision making effectiveness (Staniskis & Stasiskiene, 2006). Companies who have integrated the EMA as part of their management system provide more accurate and reliable data and information to the management.

2.3 EMA and Company Performance

Environmental management accounting is still being questioned by some researchers if brings any benefits to the companies or not due to the mixed findings from previous researches. On one hand, Link and Naveh (2006) argued that the standardisation of quality assurance leads to better environmental performance and therefore he concluded that environmental performance does not bring benefits to the company's performance. Wagner (2005) found a negative relationship between output-based index of environmental performance and financial performance.

However, the results of a study by Al-Tuwaijri, Christensen, and Hughes (2004) and Ong et al. (2014) revealed a significant relationship between environmental and financial performance on the grounds that this study used stock price as a financial performance variable. Melnyk et al. (2003) used 1222 manufacturing firm managers as the study sample and concluded that environmental performance has positive significant impact on the 10 corporate financial performance measures.

3. ISO 14001 Certification

The ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The ISO 14001 is an international standard for environmental management systems that was introduced in September 1996. It addresses diverse aspects of environmental management and helps companies identify and control their environmental impact and constantly improve their environmental performance.

Instead of focusing on performance standards and specific environmental outcomes, ISO 14001 tends to concentrate on management processes (Bansal & Bogner, 2002). International Standards on

environmental management are intended to provide organisations with the elements of an effective environmental management that can be incorporated with other management requirements and help organisations to achieve environmental and economic goals.

3.1 EMA & ISO 14001

Adoption of environmental management accounting signals corporate sustainability practices. Statistically speaking, about 220,000 companies all around the world have incorporated ISO 14001 guidelines in their practices as a sign of environmental management system adoption (ISO, 2013). In fact, many researchers have supported that ISO 14001 certification can be regarded as a useful tool to implement an organisation's environmental strategy. Among them are Balzarova and Castka (2008), Meynlk et al. (2003), and Zutshi and Sohal (2004). Since ISO 14001 is the most popular and highly recognised environmental management system, this study focuses on ISO 14000 as a proxy of the general adoption of environmental management accounting.

3.2 Implementation of EMA & ISO 14001 in Various Countries

The EMA is gradually becoming more vital not only for all environmental management decisions, but also routine management activities. Organisations who use EMA as part of their integrated management system, provide more precise and complete information. In this section, the practices, statuses and achievements of the EMA will be examined in both developed and developing countries.

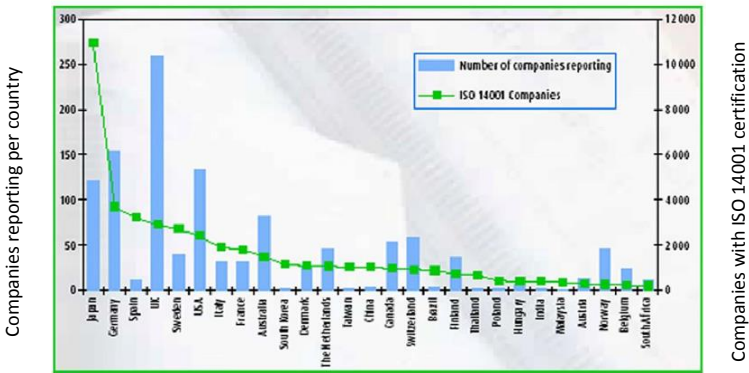
In developed countries such as Lithuania, the main reason for most organisations in introducing EMA is the logical consequence of costs and benefits rather than “green” idealism (Staniskis & Stasiskiene, 2006). Analysis of several case studies such as by Stasiskiene (2001), Christine and Gyallay-Pap (1998), and United Nations (2003), revealed that there is a need for improved consistency between physical and monetary data and related departments, material flow accounting as a basis for good cost accounting, and adequate treatment of contingent costs for the assessment of investment decisions.

However, in developing countries such as Malaysia and Thailand, environmental reporting is still uncommon particularly among SMEs (Teh et al., 2012), most of this reporting is very general and descriptive in nature, regardless of recent improvements in the corporations’ engagement with strategic environmental movements (Harte, Lewis, & Owen, 1991). In the research conducted by Kuasirikum (2005) in Thailand, it was found that the majority of the interviewees confirmed that the companies should conduct

their business in a more responsible way. However, the interviewees were not able to understand the relationship between environmental management accounting and the corporate social responsibilities. Thus, Kuasirikum (2005) suggests that accounting profession should bear the responsibility of resolving social and environmental problems.

Figure 1 compares the number of companies in various countries that report on environmental issues and also some of the companies with ISO 14001 certification. Overall, 15 out of the 27 countries have more companies with ISO 14001 than the reporting practices. It is interesting to note that Japan, the world’s leading country certified to the ISO standard, has approximately 10% of the total ISO 14001 certified companies producing environmental reports. In contrast, the UK has a ratio of approximately 1:4 or 25% of ISO 14001 certified companies compared with the number of companies that produce environmental reports. In general, it can be observed that the reason for the existence of large differences between companies reporting and companies certified to the ISO standard, especially in UK, USA, Canada and Norway is that these countries have some form of mandatory regulations for environmental reporting. In other words, these countries can actually be classified into developed countries category.

Figure 1: Environmental reporting companies and ISO 14001 companies



Source: CorporateRegister.com, July 2003, quoted from Sumiani, 2007.

4. ISO 14001 and Financial Performance

The ISO 14001 as an important variable for environmental management accounting has always been used by many researchers (Canon & Garces, 2006; Link & Naveh, 2006; Paulraj & Jong, 2011).

Various arguments have been made on the relationship between firms’ corporate social responsibility, especially in the environmental aspect, and

their financial performance (Margolis, Elfenbein, & Walsh, 1997; McWilliams & Siegel, 2000; Walsh, Weber, & Margolis, 2003; Margolis & Walsh, 2003; Orlitzky, Schmidt, & Rynes, 2003; Barnett & Salomon, 2006; Brammer & Millington, 2008; Hull & Rothenberg, 2008; Pelozo, 2009; Godfrey, Merrill, & Hansen, 2009). These researchers believe favourable corporate social responsibility policy and performance as well as meeting the needs of corporate stakeholders will ultimately lead to a favourable financial performance.

However, some researchers believe (Barnett & Salomon, 2006; Paulraj & Jong, 2009; Albertini, 2013) that improvements in environmental management will lead to a reduction in profitability. Those proposing a negative relationship between environmental performance and financial performance claim that when firms are trying to enhance environmental performance, resources and management efforts will be drawn away from core areas of the business, resulting in lower profits. According to this opinion, managers cannot accomplish both environmental and core business activities simultaneously (Klassen & McLaughlin, 1996; Hull & Rothenberg, 2008). Researchers also believe that firms have to trade-off between environmental responsibility and their financial performance (Heras-Saizarbitoria et al., 2011; Albertini, 2013). Failure to meet stakeholders expectations will ultimately lead to reduced confidence in the business by the business operators which results in perceiving a high risk premium. Hence, companies inevitably incur higher costs of capital and probably lose profit opportunities. Generally, a good environmental performance comes at the expense of a good financial performance because the former makes use of companies' resources in ways that confer significant managerial benefits rather than devoting those resources to alternative investment projects. Table 1 shows a summary of studies that examine the relationship between environmental variables and financial performance.

In this study, it is argued that investments leading to environmental protection and initiatives contribute to achievement of superior corporate financial performance. As a result, the following hypotheses were developed:

- H1: There is a significant positive relationship between adoption of ISO 14001 and return on asset (ROA) of companies.
- H2: There is a significant positive relationship between adoption of ISO14001 and return on equity (ROE) of companies.

Table 1: Summary of studies examining the relationship between environmental variables and financial performance

Research Variables	Studies
Toxic Release Inventory (TRI) emissions and ROA & ROE	Cohen et al. (1995)
ISO 14001 certification and Tobin’s Q ratio	Wahba (2008)
EMS Adoption and ROA, profit margin	Watson et al. (2004)
ISO 14001 certification and Stock Price	Canon & Garces (2006)
ISO 14001 rules and Gross Profit Margin	Link and Naveh (2006)
ISO 14000 certification and ROA	Lo et al. (2012)
ISO 14001 and stock performance	Paulraj & Jong (2009)
ISO 14001 and ROA, ROR, OPR	Zhao (2006)

Source: Authors

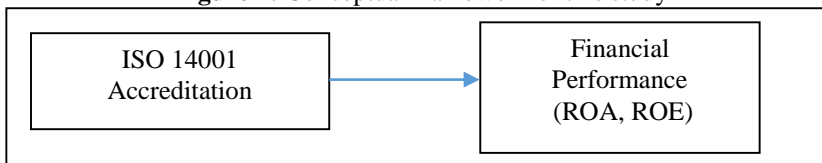
4.1 Control Variables

This study aimed to test the relationship between financial performance and ISO certification. According to previous research such as by Gourlay and Pentecost (2002) and Hudson and Orviska (2013), ownership of the company plays a vital role in the certification to the ISO 14001 environmental management standard. Thus, this study included ownership status as one of the controlled variables. In addition, according to Nishitani (2009) and Welch, Mazur, and Bretchneider (2000), a firm’s size is also a noteworthy variable that researchers may want to consider as larger firms face more pressure from their stakeholders towards environmental awareness issues. Thus, the firm’s size is included as one of the controlled variables in this study as well.

4.2 Conceptual Framework

Figure 2 illustrates the conceptual framework of the study in which ISO 14001 certification is the proxy for EMA while ROA and ROE indicate the firm’s financial performance variables. Table 2 below shows the operationalisation of the research variables.

Figure 2: Conceptual framework of this study



Source: Authors

Table 2: Operationalisation of research variables

Research Variable	Operationalisation	Previous Study
Control Variables:		
Ownership	Local – 1	1. Henri & Journeault (2008)
	Foreign -2	2. Zainol & Zailani (2005)
	Joint Venture – 3	3. Nishitani (2009)
		4. Nishitani (2010)
Firm Size	Number of full time employees	1. Turk (2006)
		2. Chenhall (2003)
		3. Henri & Journeault (2008)
		4. Heras-Saizarbitoria et al. (2011)
Independent Variables:		
ISO Certification	ISO Certification – 1 Non-ISO Certification -2	1. Wahba (2008)
		2. Canon & Garces (2006)
		3. Link & Naveh (2006)
		4. Cohen et al. (1995)
		5. Watson et al. (2004)
		6. Lo et al. (2012)
		7. Zhao (2006)
Dependent Variables:		
Financial Performance	ROA	1. Cohen et al. (1995)
		2. Watson et al. (2004)
		3. Lo et al. (2012)
		4. Zhao (2006)
	ROE	1. Lorenzo & Branco (2013)
2. Cohen et al. (1995)		
3. Edwards (1998)		
4. Wagner et al. (2002)		
5. Wagner (2005)		

Source: Authors

4. Research Methodology

The study population consists of all manufacturing companies listed in Bursa Malaysia in 2013. This study used a simple random sampling technique to draw a sample of 68 companies out of a total of 254 manufacturing companies listed in Bursa Malaysia. The sample companies have reported their environmental management such as sustainability report. The sample size, with regard to a population size of 254 and using a confidence level of 5 percent, is supposed to be 154 companies (Israel, 1992). However, since

only 68 companies out of 154 have disclosed their environmental management, the sample size is reduced to 68 companies.

The sample consists of selected Malaysian public listed companies. These listed companies are larger in size and which have disclosed their environmental management information. Manufacturing can be defined as the production of goods or items by using machines, equipment and labour force. Manufacturing activities varies from handicraft items to technology gadgets. But the term is applied to the process of industrial production in which raw materials are transformed into finished goods and ready for sale.

In this study, annual reports of the selected companies are used as the major source of data, where environmental management reporting can be obtained. context.

4.1 Descriptive Analysis

A total of 68 companies were investigated in this study and company data was obtained via Bursa Malaysia website, which is Malaysia's listing board.

Table 3 shows the characteristics of the surveyed companies. Most of the surveyed companies are small sized (42.6%), followed by big companies (36.8%) and medium size companies (20.6%). In terms of ownership types, more than 81% of the surveyed companies are locally-owned, 13.2% come from joint ventures and only 5.3% are made up of foreign-owned companies. Table 4 shows that out of the total 68 companies, 56% of the companies do not have the ISO 14001 certification while the rest do.

Table 3: Company Profile

Size of company	No.	Percentage (%)
Big	25	36.8
Medium	14	20.6
Small	29	42.6
Total	68	100
Ownership of Company	No.	Percentage (%)
Locally Owned	50	73.5
Joint Venture	8	11.8
Foreign Owned	10	14.7
Total	68	100

Source: Bursa Malaysia website.

Table 4: ISO Certification and Non-Certification Company based on company Profile

Size of the Company	ISO Certified Firm		Non-Certified Firm	
Large	17	56.7%	8	21.0%
Medium	8	26.7%	6	15.8%
Small	5	16.6%	24	63.2%
Total	30(44.12%)	100%	38(55.88%)	100%
Locally Owned	19	63%	31	81.6%
Joint Venture	3	10%	5	13.2%
Foreign Owned	8	27%	2	5.3%
Total	30	100%	38	100%

Source: Bursa Malaysia website

Among the ISO 14001 accredited companies, majority are big (56.7%) in size and locally-owned (63%). For non-ISO accredited companies, most of the companies are small in size (63.2%) and locally-owned (81.6%). This finding shows that companies that are bigger in size and with more resources tend to apply for ISO 14001 certification. In addition, Malaysian companies are also advanced in environmental management implementation via ISO 140001 certification. The high awareness among Malaysian companies indicate a good sign of environmental management activities in Malaysia. Table 5 indicates the descriptive statistics for all variables of the study.

Table 5: Descriptive statistics for research variables

Variables	Min	Max	Mean	Median	Mode	Standard Deviation
ROA	-17.77	29.00	5.826	4.950	-0.165	7.720
ROE	-25.42	37.27	8.930	8.365	-0.168	11.559
ISO 14001	0.000	1.000	0.206	0.000	0.000	0.406
Size	1.000	3.000	1.7726	1.000	1.000	0.8915
Ownership	1.000	3.000	1.470	1.000	1.000	0.752

Source: Computed by Authors

4.2 Normality Test

Table 6 shows both Shapiro-Wilk's significance numbers for ROA and ROE are more than 0.05 (0.093 for ROA, 0.083 for ROE), which is the evidence of normal distribution of data.

Table 6: Normality test on return on asset (ROA) and return on equity (ROE)

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	Df	Sig.
ROA	.097	68	.187	.969	68	.093**
ROE	.110	68	.041	.969	68	.083**

^a. Lilliefors Significance Correction.

** p<0.05 indicate data is normally distributed.

4.3 Correlation Analysis

As the results of the Pearson Correlation analysis in Table 7 shows, there is no cross correlation problem among variables.

Table 7: Pearson correlation analysis

Variable	ROA	ROE	ISO14001	Size	Ownership
ROA	1	0.716**	-0.052	-0.083	-0.074
ROE		1	-0.217**	-0.100	-0.082
ISO14001			1	-0.115	0.153
Size				1	0.186*
Ownership					1

**Correlation is significant at the 0.01 level (two-tailed).

*Correlation is significant at the 0.05 level (two-tailed).

4.4 Linear Regression Test

The linear regression test is one of the methods to assess the associations between dependent variable and independent variables. In this study, this test was employed to test both of the hypotheses about the relationship between dependent variables (ROA & ROE) and independent variables (ISO) with control variables (ownership, and firm’s size).

Table 8 below shows adjusted R square is 0.088, which indicates that 8.8% variance in the dependent variable (ROA) is explained by independent variables including company size, ownership and ISO certification.

Table 8: Model summary of linear regression test on ROA

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.359 ^a	.129	.088	7.37142

^a. Predictors: (Constant), Size, Ownership, ISO.

Table 9 shows the t-value of ISO is 2.175, which means that a 1% change in ISO will lead to 217.5% change in ROA. This implies that the adoption of

ISO will have a relatively significant impact on the financial performance in terms of ROA. Besides, 217.5% is a negative figure, which states that the ISO 14001 adoption impacts on financial performance.

Table 9: Coefficients table on ROA

Model	Unstandardised Coefficients		Standardised t Coefficients		Sig.
	B	Std. Error	Beta		
(Constant)	-.631	2.799		-.226	.822
1 ISO	3.971	1.825	.257	-2.175**	.033***
Ownership	1.261	1.310	.113	.963	.339
Size	2.427	1.595	.179	1.521	.133

^a. Dependent Variable: ROA.

** positive sign indicates that the relationship is positive.

*** $p < 0.05$ indicate data is significant.

Table 10 shows the adjusted R-square for variable ROE was 0.108 indicating that 10.8% variance in independent variable (ROE) was explained by dependent variables, which are size of company, ownership and certification to ISO. The reason for the low R-square reveals that ISO certification is not the only variable determining a firm's performance. Thus, there are many factors influencing a firm's performance which are not included in the study. However, the significant result indicates the importance of environmental management in an organisational setting.

Table 10: Model summary of linear regression test on ROE

Model	R	R Square	Adjusted Square	RStd. Error of the Estimate
1	.384 ^a	.148	.108	10.91833

^a. Predictors: (Constant), Size, Ownership, ISO.

Table 11 shows t-value of ISO was 2.175 which indicates that a 1% change in ISO will lead to 217.5% change in return on equity. Furthermore, 217.5% is in a negative figure which indicates that the impact of ISO on ROE is in a negative direction, as ISO Certification is categorised as 1 and Non-ISO Certification is categorised as 2.

Table 11: Coefficients table on ROE

Model	Unstandardised		Standardised T		Sig.
	Coefficients		Coefficients		
	B	Std. Error	Beta		
1 (Constant)	-1.136	4.146		-.274	.785
ISO	5.880	2.704	.254	-2.175**	.033***
Ownership	1.007	1.940	.060	.519	.606
Size	4.980	2.363	.245	2.108	.039

^a Dependent Variable: ROE.

** positive sign indicates that the relationship is positive.

*** $p < 0.05$ indicate the data is significant.

In a nutshell, the linear regression model has proved that both hypotheses are supported in this study. Certification to ISO 14001 has a significant relationship on companies' financial performance; the financial performance variables in this study were return on assets and return on equity. In addition, both relationships are in a positive direction which implies that the higher the degree of ISO 14001 adoption, the higher the companies' financial performance (ROA and ROE) will be. It must be noted that the adjusted R squares are low for both regression models. One explanation is that there are other variables not being considered in this model.

4.5 Analysis of Variance (ANOVA)

This study also employed the ANOVA to test the significant relationships between ROA, ROE and ISO 14001 certification (Table 12(a), (b)).

Table 12(a): ANOVA table on ROA

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	515.962	3	171.987	3.165	.030 ^b
Residual	3477.620	64	54.338		
Total	3993.582	67			

^a Dependent Variable: ROA.

^b Predictors: (Constant), Size, Ownership, ISO.

Table 12(b): ANOVA table on ROE

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	1322.376	3	440.792	3.698	.016 ^b
Residual	7629.431	64	119.210		
Total	8951.807	67			

^a. Dependent Variable: ROE.

^b. Predictors: (Constant), Size, Ownership, ISO.

The tables above show that both significant values of ANOVA for ROA and ROE are 0.030 and 0.016 respectively. Any significant value which is below 0.05 indicates that there is a significant relationship between the study variables. Consequently, support for each hypothesis can be explained as:

H1: There is a significant positive relationship between adoption of ISO 14001 and return on asset (ROA) of companies.

H1 is supported since the ANOVA significance value in Table 11(a) is 0.03, which is lower than 0.05.

H2: There is a significant positive relationship between adoption of ISO 14001 and return on equity (ROE) of companies.

H2 is supported since the ANOVA significance value in Table 11(b) is 0.016, which is lower than 0.05.

5. Results and Discussions

The results of this study shows that ISO 14001 has strengthened a few aspects of the sampled companies, which may directly or/and indirectly affect their financial performance. For instance, the public's environmental awareness is increasing, which brings the attention of the public towards the companies' corporate social responsibility. Therefore, some of the consumers will preferably conduct business with companies which are more green or environmentally aware.

It is noted that many of the investors believe that companies which pay particular attention to the environment would be more sustainable than those which are not. Therefore, investors will also choose to invest in more green companies in the long run. One of the indications of green companies is whether they have adopted the ISO 14001 standard.

Furthermore, the ISO 14001 contributes to a company's success more than just serving as a mere standard. It assists companies to establish a system

which can protect the environment while helps them to save cost in the long run. For example, a more systematic way to dispose wastage not only preserves the earth, but also reduces the costs of raw materials by recycling the wastage.

In a nutshell, the results show that companies benefit from ISO14001 adoption to build up their public image, reputation, and a better system, which by saving more costs, they are able to out-perform those who do not have ISO 14001 certification. Thus, companies which have adopted the ISO certification show a higher and better financial performance compared with those who have not.

Therefore, both hypotheses in this study are supported. This is in line with previous studies such as those by Margolis and Walsh (2003), McWilliams and Siegel (2000), Walsh et al. (2003), Pelozo (2009), Godfrey et al. (2009), Hull and Rothenberg (2008).

Nevertheless, there are some opinions which are arguable. One of them is that the process of ISO 14001 adoption is costly and time-consuming. That is why the majority of the companies which apply for ISO 14001 certification are well-established and well-performed ones with a steady growth condition. The result also indicates the two-way effects. Firstly, ISO14001 certification results in the company showing higher financial performance. Secondly, good financial performance will urge the companies to adopt ISO 14001.

6. Limitations and Recommendations

This study like other studies have some limitations. Due to resource constraints, all samples employed in this study are listed companies, in spite of the fact that some of the private limited companies have also adopted ISO 14001 standard. Moreover, of the 100 companies initially selected for the study, only 68 of them were actually sampled due to time constraints.

Another limitation is using secondary data which prohibited the possible inclusion of some significant qualitative criteria in this study. For instance, qualitative factors such as industry culture, company's culture, managers' awareness, government's rules and regulations, should be considered in the adoption of ISO 14001.

The last but definitely not the least limitation relies on using ISO 14001 as an indicator of environmental performance. However, there are a lot more alternative indicators for environmental performance, such as efforts in developing an eco-friendly system. Besides, some companies do not apply for ISO 14001 certification, even though they pay great attention to environmental issues. It is also worth noting that as this study was conducted

in the Malaysian context, the results might not be applicable to other countries or regions.

In future studies, it is suggested they should include both listed and non-listed companies in the study sample. It is recommended that future studies focus on specific industrial field to check whether there is any specific industry influence on the adoption of ISO 14001 or not. Additionally,, a more qualitative way of collecting data, like distributing questionnaire to managers of corporate social department, should be employed in future studies. With respect to data analysis method, structural equation modelling (SEM) is recommended for more detailed results. As every country has its own environmental policies and regulations, future studies may need to be conducted in different countries and regions.

7. Conclusion

Awareness of environmental management issues has increased since the past decade. Investors and other stakeholders will have more confidence in the planning processes of the businesses that observe environment considerations. This paper investigated how ISO 14001 certification, as an index for Environment Management Accounting (EMA) evidence, has influenced the financial performance of Malaysian Public Listed Companies. The sample study consisted of 68 PLCs with control variables such as firm size, including big, medium, and small, and also ownership statuses consisting of Locally Owned, Joint Venture, and Foreign Owned.

The results revealed that financial performance of Malaysian PLCs in terms of ROA and ROE have improved after the ISO14001 adoption. These results are consistent with some of the previous researches about the positive effect of adopting environmental issues on firms' financial performance (Barnett & Salomon, 2006; Brammer & Millington, 2008; Hull & Rothenberg, 2008; Pelozo, 2009; Godfrey et al., 2009). Besides, this significant relationship for Malaysia as a developing country illustrates that Malaysian investors are prioritising to invest in companies with better environmental management. In addition, companies are benefiting from EMA adoptions to reduce cost, improve performance, increase brand awareness and publicity. Therefore, this study recommends more companies in Malaysia to adopt EMA standards such as ISO 14001 for better ROA and ROE. Malaysian stock exchange (Bursa Malaysia) standard setters are highly advised to provide more mandating rules for PLCs to adopt EMA practices so that not only companies enjoy the financial advantages from this adoption, but also the whole country benefits from preserving its environment.

References

- ACCA. (2004). *Report summary: The state of corporate environmental and social reporting in Malaysia*. Kuala Lumpur: ACCA Malaysia Sdn. Bhd.
- Albertini, E. (2013). Does environmental management improve financial performance? A meta-analysis review. *Organization and Environment*, 26(4), 431-457.
- Al-Tuwaijri, S.A., Christensen, T.E., & Hughes, K.E. (2004). The relations among environmental disclosure, environmental performance, and economic performance: A simultaneous equations approach. *Accounting, Organizations and Society*, 29(5-6), 447-472.
- Balzatova, M.A., & Castka, P. (2008). The impact of ISO 9000 and ISO 14000 on standardisation of social responsibility - An inside perspective. *International Journal of Production and Economics*, 113(1), 74-87.
- Barnett, M.L., & Salomon, R.M. (2006). Beyond dichotomy: The curvilinear relationship between social responsibility and financial performance. *Strategic Management Journal*, 27(11), 1101-1122.
- Bansal, P., & Bogner, W.C. (2002). Deciding on ISO 14001: Economics, institutions, and context. *Long Range Planning*, 35(3), 269-290.
- Bennett, M., & James, P., (1998). Environment-related performance measurement in Business. From Emissions to Profit and Sustainability? *Ashridge Management Research Group*.
- Bennett, M., & James P., (1998A). The green bottom line. In *The green bottom line - Environmental accounting for management current practice and future trends* (pp. 30-60). Sheffield: Greenleaf Publishing.
- Brammer, S., & Millington, A. (2008). Does it pay to be different? An analysis of the relationship between corporate social and financial performance. *Strategic Management Journal*, 29(12), 1325-1343.
- Burritt, R.L. (2001). *Econ-efficiency in corporate budgeting*. Luneburg: Center for Sustainability Management.
- Burritt, L., Hahn, T., & Schaltegger, S. (2001). Current Developments in Environmental Management Accounting - Towards a Comprehensive Framework for Environmental Management Accounting (EMA). Universitaet Lueneburg.
- Burritt, R.L., & Saka, C. (2006). Environmental management accounting applications and eco efficiency: Case studies from Japan. *Journal of Cleaner Production*, 14 (14), 1262-1275.
- Canon-de-Francia, J., & Garcés-Ayerbe, C. (2006). ISO 14001 environmental certification: A sign valued by the market? *Environmental and Resource Economics*, 44(2), 245-262.

- Chenhall, R. (2003). Management control systems design within its organizational context: findings from contingency-based research and directions for the future. *Accounting, Organizations and Society*, 28(2), 127-168.
- Cohen, M., Fenn, S., & Naimon, J. (1995). Environmental and financial performance: Are they related? Analytical review. *Organization & Environment*, 26(4), 431-457.
- Cohen, M., Fenn, S., & Naimon, J., (1995) Environmental and Financial Performance: Are They Related? *Investor Responsibility Research Center, Environmental Information Service*.
- Deegan, C., & Gordon, B. (1996). A study of the environmental disclosure practices of Australian corporations. *Accounting and Business Research*, 26(3), 187-199.
- Edwards, D. (1998). *The link between company environmental and financial performance*. London: Earthscan Publications.
- Environmental Accounting Guidelines. (2002). Ministry of the Environment.
- Environmental Resources Management Malaysia. (2002). *The state of 'corporate environmental reporting in Malaysia*. London: Certified Accountants Educational Trust.
- Envirowise. (2003). For practical environmental help and advice for business. Retrieved from www.envirowise.gov.uk/envirowise3.nsf
- Frost, G.R., & Wilmshurst, T.D. (2000). The adoption of environment-related management accounting: An analysis of corporate environmental sensitivity. *Accounting Forum*, 24(4), 344-365.
- González-Benito, J., & González-Benito, O. (2005). Environmental proactivity and business performance: An empirical analysis. *Omega*, 33(1), 1-15.
- Gavrinski, I., Ferrer, G., & Paiva E.L. (2008). ISO 14001 certification in Brazil: Motivations and benefits. *Journal of Cleaner Production*, 16(1), 87-94.
- Godfrey, P. C., Merrill, C. B., & Hansen, J. M. (2009). The relationship between corporate social responsibility and shareholder value: An empirical test of the risk management hypothesis. *Strategic Management Journal*, 30(4), 425-445.
- Gourlay, A., & Pentecost, E. (2002). The determinants of technology diffusion: Evidence from the UK financial sector. *The Manchester School*, 70(2), 185-203.
- Harte, G., Lewis, L. & Owen, D. (1991). Ethical investment and the corporate reporting function. *Critical Perspectives on Accounting*, 2(3), 227-254.
- Henri, J. F., & Journault, M. (2008). Environmental performance indicators: An empirical study of Canadian manufacturing firms. *Journal of Environmental Management*, 87(1), 165-176.

- Heras-Saizarbitoria, I., Molina-Azorin, J.F., & Dick, G.P.M. (2011). ISO 14001 certification and financial performance: selection-effect versus treatment effect. *Journal of Cleaner Production*, 19, 1-12.
- Hewitt, G. (2012). *Is corporate Asia ready for the green economy?* Association of Chartered Certified Accountants.
- Horvathova, E. (2010). Does environmental performance affect financial performance? A meta-analysis. *Ecological Economics*, 70(1), 52-59.
- Hudson, J., & Orviska, M. (2013). Firms' adoption of international standard: One size fits all? *Journal of Policy Modelling*, 35(2), 289-306.
- Hull, C. E., & Rothenberg, S. (2008). Firm performance: The interactions of corporate social performance with innovation and industry differentiation. *Strategic Management Journal*, 29(7), 781-789.
- International Federation of Accountants (IFAC). (1998). *Management Accounting Concepts*. New York: IFAC.
- International Organisation for Standardisation (ISO). ISO 14000 – Environmental management. Retrieved from <http://www.iso.org/iso/home/standards/management-standards/iso14000.htm>
- Israel, G. D. (1992.) *Sampling The Evidence Of Extension Program Impact*. Program Evaluation and Organizational Development, IFAS, University of Florida.
- Jasch, C., & Gyallay-Pap, R. (1998). Environmental statements and environmental performance indicators in Austria and Germany. *IOW Vienna, Informationsdienst*, 4.
- Jasch, C. (2003). The use of Environmental Management Accounting (EMA) for identifying environmental costs. *Journal of Cleaner Production*, 11(6), 667-676.
- Jasch, C. (2006). Environmental management accounting (EMA) as the next step in the evolution of management accounting. *Journal of Cleaner production*, 14(14), 1190-1193.
- Johnson, S. (2004) *Environmental Management Accounting*. Retrieved from <http://test.accaglobal.com/en/student/qualification-resources/students-acca/acca-exams/acca-exams10/exams-p54/environmental-management.html>.
- Jones, M.J. (2011). The nature, use and impression management of graphs in social and environmental accounting. *Accounting Forum*, 35, 75-89.
- Klassen, R. D., & McLaughlin, C. P. (1996). The impact of environmental management on firm performance. *Management Science*, 42(8), 1199-1214.
- King, A. A., & Lenox, M. J. (2001). Does it really pay to be green? An empirical study of firm environmental and financial performance. *Journal of Industrial Ecology*, 5(1), 105–116.

- Konar, S., & Cohen, M. A. (2001). Does the market value environmental performance? *Review of Economics and Statistics*, 83(2), 281-289.
- Kuasirikun, N. (2005). Attitudes to the development and implementation of social and environmental accounting in Thailand. *Critical Perspectives on Accounting*, 16(8), 1035-1057.
- Link, S., & Naveh, E. (2006). Standardization and discretion: does the environmental standard ISO 14001 lead to performance benefits? *Engineering Management, IEEE Transactions on*, 53(4), 508-519.
- Lo, C. K., Yeung, A. C., & Cheng, T. C. E. (2012). The impact of environmental management systems on financial performance in fashion and textiles industries. *International Journal of Production Economics*, 135(2), 561-567.
- Lourence, I.C., & Branco, M.C. (2013). Determinants of corporate sustainability performance in emerging markets: the Brazilian case. *Journal of Cleaner Production*, 57(15), 134-141.
- Malaysian Certified, EMS Certification. Retrieved from <http://www.malysiancertified.my/EMSCert.aspx?company=&scope=&standard=1101&year=&status=REG&country=001&state=&licenceno=>.
- Margolis, J.D., & Walsh, J.P. (2003). Misery loves companies: Rethinking social initiatives by business. *Administrative Science Quarterly*, 48(2), 268-305.
- Margolis, J.D., Elfenbein, H.A., & Walsh, J.P. (2007). Does it pay to be good? A meta-analysis and redirection of research on the relationship between corporate social and financial performance. *Ann Arbor*, 1001, 48109-1234.
- Martin, S. (2010). Electoral rewards for personal vote cultivation under PR-STV. *West European Politics*, 33(2), 369-380.
- McPeak, C., & Dai, Q.D. (2011). Environmental issues as a part of sustainability and how they impact financial performance. *Journal of Global Business Issues*, 5(2), 49-53.
- McWilliams, A., & Siegel, D.S. (2000). Corporate social responsibility and financial performance: Correlation or misspecification? *Strategic Management Journal*, 21(5), 603-609.
- McWilliams, A., & Siegel, D.S. (2001). Corporate social responsibility: A theory of the firm perspective. *Academy of Management Review*, 26(1), 117-127
- Melnyk, S.A., Sroufe, R.P., & Calantone, R. (2003). Assessing the impact of environmental management systems on corporate and environmental performance. *Journal of Operations Management*, 21(3), 329-351.
- Mohammad, N. (2012) Need to implement the environmental accounting education for sustainable development: an overview. *World Academy of Science, Engineering and Technology*, 63, 900-907.

- Nishitani, K., (2009). An empirical study of the initial adoption of ISO 14001 in Japanese manufacturing firms. *Ecological Economics* 68 (1), 669-679.
- Nawrocka, D., & Parker, T. (2009). Finding the connection: environmental management systems and environmental performance. *Journal of Cleaner Production*, 17(6), 601-607.
- Ong, T.S., Teh, B. H., & Ang, Y. W. (2014). The Impact of Environmental Improvements on the Financial Performance of Leading Companies Listed in Bursa Malaysia. *International Journal of Trade, Economics and Finance*, 5(5), 386.
- Orlitzky, M., Schmidt, F.L., & Rynes, S.L., (2003). Corporate social and financial performance: a meta-analysis. *Organization Studies*, 24(3), 403-441.
- Paulraj, A. & Jong, P.D. (2011). The effect of ISO 14001 certification announcements on stock performance. *International Journal of Operations & Production Management*, 31(7), 765-788.
- Pelozo, J. (2009). The challenge of measuring financial impacts from investments in corporate social performance. *Journal of Management*, 35(6), 1518-41.
- Poksinska, B., Jörn Dahlgaard, J., & Eklund, J. A. (2003). Implementing ISO 14000 in Sweden: motives, benefits and comparisons with ISO 9000. *International Journal of Quality & Reliability Management*, 20(5), 585-606.
- Raar, J. (2002). Environmental initiatives: towards triple-bottom line reporting. *Corporate Communications: An International Journal*, 7(3), 169-183.
- Salama, A. (2005). A note on the impact of environmental performance on financial performance. *Structural Change and Economics Dynamics*, 16(3), 413-421.
- Shane, J. (2004). Environmental Management Accounting. *ACCA Sustainability*, 1-9.
- Staniskis, J. K., & Stasiskiene, Z. (2006). Environmental management accounting in Lithuania: exploratory study of current practices, opportunities and strategic intents. *Journal of Cleaner Production*, 14(14), 1252-1261.
- Stasiskiene, Z. (2001). Environmental accounting in Lithuanian industry: analysis of necessity, possibilities and perspectives. *Environmental Research, Engineering and Management*, 2(16), 56-64.
- Stanwick, P.A., & Stanwick, S.D. (1998). The relationship between corporate social performance and size, financial and environmental performance. *Journal of Business Ethics*, 17(2), 195-204.
- Stuart D.A. (2000). Reviewing EPA Decisions (Victoria). *Australian Environmental Law News*, 1(1).

- Sumiani, Y., Haslinda, Y., & Lehman, G. (2007). Environmental reporting in a developing country: a case study on status and implementation in Malaysia. *Journal of Cleaner Production*, 15(10), 895-901.
- Teh, B.H., Chong, L.L., Yeap, P.F., & Ong, T.S. (2012). A Framework of a Sustainable Performance Measurements (SPMs) Model for the Malaysian Electronic and Electrical Industry. *World Applied Sciences Journal*, 20(1), 107-119.
- Turk, A.T. (2006). Organisational Deviance and Political Policing. *Criminology*, 19(2), 231-250.
- United Nations. (2003). *The roads from Johannesburg: what was achieved and the way forward*. New York: United Nations.
- UNSD. (2003). *Environmental management accounting procedure and principles 'improving the role of government in the promotion of EMA*. New York: United Nations - Economic and social affairs.
- Vasile, E., & Man, M. (2012). Current dimension of environmental management accounting. *Social and Behavioral Sciences*, 62, 566-570.
- Wagner, M. (2001). *A review of empirical studies concerning the relationship between environmental and economic performance. What does the evidence tell us?* Luneburg: Centre for Sustainability Management.
- Wagner, M. (2005). How to reconcile environmental and economic performance to improve corporate sustainability: corporate environmental strategies in the European paper industry. *Journal of Environmental Management*, 76(2), 105-118.
- Wagner, M., & Schaltegger, S. (2005). How does sustainability performance relate to Business Competitiveness. *Greener Management International*, 44, 5-16.
- Wahba, H. (2008). Exploring the moderating effect of financial performance on the relationship between corporate environmental responsibility and institutional investors: same Egyptian evidence. *Corporate Social Responsibility and Environmental Management*, 15(6), 361-371.
- Walsh, J. P., Weber, K., & Margolis, J. D. (2003). Social issues and management: Our lost cause found. *Journal of Management*, 29(6), 859-881.
- Watson, K., Klingenberg, B., Polito, T., & Geurts, T.G., (2004). Impact of EMS implementation on financial performance. *Management of Environmental Quality*, 15(6), 622-628.
- Wayhan, V.B., & Balderson, E.L. (2007). TQM and financial performance: A research standard. *Total Quality Management and Business Excellence Journal*, 18(4), 393-401.
- Welch, E., Mazur, A., & Bretchneider, S. (2000). Voluntary behaviour by electric utilities: Level of adoption and contribution of the climate

- challenge program to the reduction of carbon dioxide. *Journal of Policy Analysis and Management*, 19, 417-425
- Zainol, R., & Zailani, S. (2005). Adoption factors for EMS ISO 14001 in Malaysia. *International Journal of Environmental Engineering*, 1(3), 256-275.
- Zhao, M.Y. (2006). Multiple criteria data envelopment analysis for full ranking units associated to environment impact assessment. *International Journal of Environment and Pollution*, 28(3-4), 448-464.
- Zobel, T. (2013). ISO 14001 certification in manufacturing firms: A tool for those in need or an indication of greenness. *Journal of Cleaner Production*, 43, 37-44.
- Zulkifli, N., Telford, B., & Marriott, N. (2009). Social and environmental accounting in Malaysia: Practitioners' views. *Accounting in Emerging Economics*, 9, 145-168
- Zutshi, A., & Sohal, A. (2003). Environmental management systems auditing within Australasian Companies. *Managerial Auditing Journal*, 18(8), 637-48.