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A study on the impact of environmental management system (EMS) certification towards firms' performance in Malaysia

Firms' performance in Malaysia

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Abstract

Purpose – To investigate the impact of EMS certification on the performance of firms, including economic and environmental aspects and perceived customer satisfaction.

Design/methodology/approach – The purpose of this study is hypotheses testing in order to explain the variance in the dependent variable (firms' performance in terms of economic and environmental aspects) by establishing the nature of the relationship between the dependent variable and the independent variables through the testing of the hypotheses.

Findings – The results reveal that certification impacts positively on both the environmental and economic performance of enterprises. Respondents perceived "enhanced corporate image" to be the strongest impact of certification, and they believe that the benefits obtained from EMS certification far outweigh the cost of its implementation.

Research limitations/implications – The study only surveyed ISO 14001-certified firms. Future research should include non-certified firms.

Practical implications – To improve the quality of the environment there needs to be a partnership between government, businesses and the community.

Originality/value – ISO 14001 certification has a positive impact on firms' performance, specifically on perceived economic impact, perceived environmental impact and perceived customer satisfaction. By failing to perceive a marketing opportunity from using this well-known standard, firms can lose market share.

Keywords Environmental management, Management techniques, Business performance, Malaysia

Paper type Research paper

1. Introduction

The ability of corporations to manage their environmental performance is emerging as a strategic issue for many companies worldwide. This is primarily because the environment is now regarded as an asset to be valued. Consequently, managers today are not only expected to reduce lead times, improve quality, reduce costs and enhance flexibility, they are also expected to become more environmentally responsible (Montabon *et al.*, 2000). In response to the pressing need for companies to address the impact of enterprises' activities on the environment, in 1996 the International Organization for Standardization (ISO) introduced the ISO 14000 series of standards.

The standards, claimed to be less confrontational and user-friendly, may provide a potentially innovative supplement to current environmental regulations (Murray,



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1999). The series of standards will help companies integrate environmental considerations into corporate decision-making in a more organized and systematic fashion (Gale, 1996). While the ISO 14000 family of standards deals with various matters concerning the environment, the standard that primarily focuses on environmental management systems (EMS) is ISO 14001. ISO 14001 is designed to introduce environmental improvement into every aspect of a company's operations, and offers an organized approach to manage environmental issues. The focus of the standard is on the entire organizational structure of the business, thus bringing environmental issues into the mainstream of the corporate decision-making process. Given that businesses are increasingly asserting their role as responsible social players and regarding environmental concerns as an integral part of their daily operations, the ISO 14001 standard may well be an indicator of a company's commitment to environmental responsibility (Tucker and Kasper, 1998; Murray, 1999).

In Malaysia, as in other countries with diverse economies, the ISO 14001 standard has thrown down a challenge to businesses, especially in environmentally sensitive industries such as heavy manufacturing, chemicals, semiconductors, mining and agriculture. The challenge is for them play a proactive role in the instigation and/or enhancement of the organization's environmental management systems (EMS). The creators of ISO 14001 were careful to ensure that it is applicable to organizations of varying sizes and circumstances, not just large corporations or those with economic leverage. Gaining ISO 14001 certification is one way in which a company is able to demonstrate to its customers, suppliers, competitors and the regulators that it is serious about environmental stewardship (Murray, 1999). However, many companies are still doubtful as to whether or not getting certification (Petroni, 2001) actually brings with it the numerous advantages claimed. In particular, companies want to know whether or not the benefits of certification actually exceed its costs. Research into the impact of ISO 14001 on a company's economic and environmental performances is lacking, especially in Malaysia. It is thus the objective of this study to address this issue by examining economic and environmental performance and other related issues of ISO 14001 certified companies in Malaysia.

2. Statement of the problem

The intention of the ISO 14001 standard is to drive environmental improvements worldwide through a systematic approach to environmental management. However, debates about the value of ISO 14001 and its ability to meet its lofty intentions have been going on since the early 1990s and continue today, even after several years of experience with implementation and registration to the standard. Although many proponents of the standard (Balta and Woodside, 1999) agree that ISO 14001 has met and in some instances has exceeded the intentions of its creators, there are those who feel that the monetary investment required for implementation and registration is not offset by tangible benefits. Skeptics think that overall, ISO 14001 will not improve the world's environmental situation because it does not set environmental performance or technology criteria. Further, they believe organizations that already have an established EMS will see little benefit from aligning their systems with the standard. Indeed, they think that there may even be a downside to implementing the standard,

such as added bureaucracy and requirements for extensive, unnecessary documentation.

The high cost of ISO 14001 implementation, which varies from company to company (Balta and Woodside, 1999), might actually result in the redirection of resources away from investment in more environmentally friendly processes. It is also part of the interest of this research to investigate whether or not the benefits of certification actually exceed its costs. Nevertheless, some emphatically agree with the proponents of the standard, i.e. that the implementation and registration process is well worth the expenditure of resources, and that the benefits derived from the process are tangible and indeed exceed expectations – and all at an affordable cost!

3. Research objectives

The main objectives of this study are:

- to investigate the impacts of EMS certification on firms' performance, such as economic and environmental aspects and perceived customer satisfaction; and
- to examine the benefits of adopting the ISO 14001 standard and to ascertain whether or not the benefits of EMS certification actually outweigh its implementation cost.

This study attempts to answer the following questions:

- What is the impact of ISO 14001 certification on firms' performance, such as economic and environmental aspects and perceived customer satisfaction? How is the performance of firms influenced by factors such as past experience with ISO 9000, operational orientation toward environmental responsibility, companies' ISO 14001 strategy, their ISO 14001 culture, the importance of international trade, and the functional positions of the respondents?
- Do the benefits of EMS certification actually outweigh its implementation cost?

4. Environmental management systems and firms' performance

4.1 *What is an environmental management system (EMS)?*

In today's global economy, organizations are increasingly called upon to demonstrate sound management of economic, social and environmental issues. Evidence suggests that a focus on this "triple bottom line" results in advantages in financing, insurance, marketing, regulatory treatment, and other areas. An environmental management system (EMS) is a structured approach to addressing the environmental bottom line. ISO 14001 is the world's most recognized EMS framework that helps organizations both to manage better the impact of their activities on the environment and to demonstrate sound environmental management. Since the publication of ISO 14001 in 1996, many companies have implemented the standard and, by the end of 2001, nearly 37,000 organizations in 112 countries had their EMSs certified as conforming to its requirements. ISO 14001 is designed to be flexible enough to be applied to any size of organization in both the private and public sectors. The bottom line is that certification to ISO 14001 can improve environmental management and enables equal access to a growing "green" marketplace (Montabon *et al.*, 2000).

The ISO 14000 environmental standards specify the structure of information technology, in the form of an EMS, that an organization must have in place if it seeks to obtain certification of the EMS according to ISO guidelines. The ISO 14000 standards describe the basic elements of an effective EMS. These elements include creating an environmental policy that sets out objectives and targets, implementing a program to achieve those objectives, monitoring and measuring its effectiveness, correcting problems, and reviewing the system to improve it and overall environmental performance (Tibor and Feldman, 1996). ISO 14000's EMS standards are process standards, not performance standards. In other words, these standards do not tell organizations what environmental performance they must achieve aside from compliance with environmental regulations. Instead, the standards describe a system that will help an organization to achieve its own objectives and targets. The assumption is that better environmental management will indirectly lead to better environmental performance (Tibor and Feldman, 1996).

4.2 How do ISO 9000 and ISO 14001 compare?

According to an article published by Fredericks and McCallum (1995), ISO 14001 does not replace ISO 9000. A company with an ISO 9000 registration has a good foundation for ISO 14001 and both are part of an organization's overall management system. ISO 14001 also does not replace regulations, legislation and codes of practice (such as Responsible Care) that an organization has to comply with. Rather, it provides a system for monitoring, controlling and improving performance regarding those requirements. ISO 14001 uses the same fundamental systems as ISO 9000, such as documentation control, management system auditing, operational control, control of records, management policies, audits, training, statistical techniques, and corrective and preventive action. There are also some definite differences. Besides the similarities, ISO 14001 has clearer statements about communication, competence and economics than are currently found in ISO 9000. Also, ISO 14001 incorporates the setting of objectives and quantified targets, preparedness for emergencies, considering the view of interested parties, and public disclosure of environmental policy.

To date, no research has addressed whether ISO 14000 will be widely used by businesses as a consensus model, or whether it should be. Instead, the literature is saturated with conflicting predictions and viewpoints offered by experts. The champions of ISO 14000 suggest that it will unify countries in their approach to environmental management and will eventually be looked upon more favorably than traditional measures (Cascio, 1994). Hammer (1996) argues that small manufacturing firms constitute the largest potential market for ISO 14000, and that the real test of the standards can be measured by adoption rates among these firms, which typically need the most direction in these issues. According to Hammer (1996), the development to watch is what industrial customers do with these standards with regard to their supply chains. Acceptance of the standards will come when conformance or certification becomes a condition for customer requirements. This suggests that the predisposition of corporations to ISO 14000 will mostly influence the adoption rates and, ultimately, the success of these standards. However, no research to date has examined the views of managers on ISO 14000 and the relative impact of this new approach on their view of the effectiveness and efficiency of corporate environmental management systems, as

well as the impact of ISO 14000 on corporate performance. This concern forms the major impetus for this study.

4.3 Impacts on companies' performance

As discussed in the previous section, having an ISO 14001 EMS will help enhance a firm's economic performance and at the same time improve its environmental performance. The benefits of ISO 14001 lie in cost savings through energy consumption, raw material input, waste management, environmental impact reversal as well as an improved public image (Chattopadhyay, 2001). Implementing ISO 14001 has also helped one of Rockwell's automation plants reduce its hazardous waste by 18 percent. Ford's Lima engine plant reduced its piston tin-plating process, resulting in a reduction in water usage by 2.4 million gallons annually (Moretz, 2000). Lockheed Martin's Syracuse plant was able to reduce its wastewater reduction by 86 percent, solid waste reduction by 78 percent and process waste reduction by 34 percent. In addition, recycling at the plant improved by 22 percent (Moretz, 2000). Hogarth (1999), in her study of Milan Screw, a small to medium-sized enterprise (SME) in Michigan, reported cost savings of \$20,000 when the company designed a better oil removal system as a result of putting in place an ISO 14001 EMS. One company reported that it was not only able to recycle 94 percent of its waste, but that the company was also able to create a profit center (Fielding, 1999).

Despite the hype it has been receiving, environmental management according to ISO 14001 (McCallum and Fredericks, 1996) is not a magic potion. It will not save the world, nor will it save your company, or the board of directors. It is a management system – that is all. It does not replace the common environmental performance levels (regulations, industry codes, etc.) that a company must comply with. Rather, it provides a system for tracking, managing and improving performance regarding those requirements. In another research study, Montabon *et al.* (2000) suggest that companies overall do not see environmental management systems in a positive light. In general, they conclude that these systems are perceived as having a strong negative impact on the major strategic dimensions of a company's performance (i.e. lead time, costs, and quality), and that these systems do not enhance a firm's competitive position in the marketplace, nor do they improve a firm's ability to sell its products internationally. The authors found that a company's attitude toward the standards was influenced by the progress of its plant in attaining ISO 14000 certification.

Although it is still too early to evaluate fully the effects that ISO 14001 will have on marketplace advantage, some areas have already enthusiastically embraced the standard (Balta, 1999). These include the Asia-Pacific region, with Japan having over 25 percent of ISO 14001 registrations worldwide, and Europe. Indeed IBM, as a large multinational company, has felt customer pressure for registration in these areas. One international company for which IBM is a supplier gives points on their satisfaction survey for having ISO 14001 registration. Indeed, many companies worldwide are finding it advantageous to align their EMS with the standard and register as customer needs require.

4.4 Commitment, orientation, culture and cost of ISO 14001 certification

Issued in September 1996, ISO 14001 consists of five essential requirements (that are based on traditional management principles) (Boiral and Sala, 1998):

- (1) commitment and policy;
- (2) planning;
- (3) implementation and operation;
- (4) checking and corrective action; and
- (5) management review and continual improvement.

The first requirement necessitates the existence of a written environmental policy and a corporate commitment to environmental improvement. Essentially, what this means is that the company must conform to all applicable national laws and regulations, must include pollution prevention as one of its policies, and must have a commitment towards continuously improving environmental performance. The plan of action indicates the “what”, the “how” and the “when” of environmental management. Generally, this stage describes what the company is going to do, how it is going to go about doing it, and when it is to be done. Central to the effective operation of the EMS is employee involvement. Without it, the system may not bring significant improvements to the environment. As a consequence, the allocation of responsibility is a crucial element of ISO 14001. The checking and corrective action elements of the system help ensure continuous improvement by addressing root causes or non-conformances. It is at this stage that the auditing aspects are pertinent. The ongoing management review of the EMS and its elements help ensure the continuing suitability, adequacy and effectiveness of the program. In addition, management review gives the system credibility and reinforces its diligent operations. Thus, while an audit examines the structure of the EMS and its component parts (ensuring that the requirements of ISO 14001 are in place), management review focuses on the EMS itself and its interrelationship with the functioning of the company as a whole. These requirements appear to be similar to Deming’s plan-do-check-act cycle (Graff, 1997; Corbett and Kirsch, 2000).

Clearly the benefits of ISO 14000 certification are many: gaining market place and shareholder advantages, insurance hedging, reduced costs, other financial benefits, and achieving higher productivity. But how do the ISO 14000 standards assist firms? There are a few underlying potential benefits of the ISO 14001 certification (D’Souza, 2004):

- ISO 14000 helps firms to implement their commitment to environmental excellence, helps avoid multiple registrations, inspections, certifications, labels and conflicting requirements, and removes the need for certain regulatory “command and control” initiatives.
- ISO 14000 should facilitate international trade and remove trade barriers. For example, in Manila, large as well as small firms have been asked by the government to comply to these standards in order to remain competitive.
- These systems can also assist companies in targeting green consumers. By showing their support for environmental protection issues through their marketing of green products, organizations can pursue a distinctive way of competing.

Firms in Brazil reported enhanced public image to be one of the greatest benefits of ISO 14001 certification. Evidence from Formosa Plastics Corp. in Livingston, New Jersey,

also supported this contention (Corbett and Kirsch, 2000). In Japan, however, it was found that only the first firm to obtain certification in a given industrial sector enjoyed this benefit. Other benefits cited include increased market share (when customers seek only ISO 14001 certified suppliers) and improved profitability (through waste reduction). Although various other companies reported having improved competitiveness, this was largely non-quantifiable (Corbett and Kirsch, 2000). Additionally, ISO 14001 certification also leads to improved customer satisfaction, improved efficiency of operations and processes, improved community relations, cost reduction, and improved risk management practices (Fielding, 1999; Petroni, 2001). Other ISO 14001 certified companies reported increased compliance with complicated regulations, more motivated employees, more transparent and effective organizations, lower risk of liabilities, better allocation of responsibilities and better information flow of environmental matters (Steger, 2000).

The evidence just provided serves to support the contention that, indeed, an ISO 14001 EMS would enable a company to simultaneously improve its bottom line and its environmental performance. The findings of Boiral and Sala (1998), however, seem contrary to this assertion. They found that not all managers at Alcan Smelters and Chemicals Ltd (AS&C) in the US believed that adopting the ISO 14000 standards would improve environmental performance. Despite this, there has been an ever-increasing number of companies getting certification. In Malaysia, for example, as of 30 June 1999, there were 101 certified sites. As of June 2001, the number had risen to 134, and it is still increasing. Whether the increase is brought about by management wanting to convey a favorable perception of environmental performance through site credentialism (Taylor *et al.*, 2001) (i.e. a public relations exercise) or out of a genuine concern for the environment may be difficult to determine. Both sets of motivations may well lead to positive outcomes.

The decision to seek ISO 14001 certification should be evaluated in the same manner as any other business decisions (Corbett and Kirsch, 2000). Consequently, cost-benefit analysis has been a central issue examined in prior empirical work (Steger, 2000). The cost of implementation (which includes the cost of training, documentation, process modification, registration fee, registration maintenance, organizational adaptation and legal consequences) is generally dependent on the size of the site and whether or not the company possesses prior experience with the implementation of ISO 9000 standards on quality. Costs may range from €50,000 to €100,000 (Steger, 2000). Graff (1997) puts the cost of putting in place an ISO 14001 EMS as being between US\$15,000 and US\$150,000 per site. Rockwell Automation spent about US\$50,000 for each of its 44 ISO 14001 certified sites (Moretz, 2000). According to Corbett and Kirsch (2000), obtaining ISO 14001 certification is not a major resource-intensive undertaking. None of the companies that participated in their study felt that the certification process was excessively expensive or onerous.

However, the data for a cost-benefits analysis of an EMS are fragmented and contradictory (Steger, 2000). In Steger's (2000) review of empirical studies in Europe, he found that there was no common definition of the elements that were included in the "cost" of the EMS. While some companies included only the cash cost, others included the follow up actions "triggered by a discovery" in the process of establishing the EMS. Further, he argues that while costs may be immediate and measurable, the benefits are

difficult to measure and determined. How does one measure positive (enhanced) image of a company or increased motivation on the part of employees? This is primarily because the potential benefits are intangible. It is “impossible to tally unwritten citations, fines not levied and lawsuits not filed” (Hogarth, 1999, p. 123). Thus, the advantages claimed, such as a positive public image or increased motivation on the part of employees, are just *perceived* benefits that are neither measurable nor empirically verifiable. In line with this, prior research (e.g. Montabon *et al.*, 2000) examining the impact of ISO 14001 EMS on environmental and economic performance has systematically sought respondents’ perceptions of the benefits of ISO 14001. Our study continues this trend by examining certified sites in Malaysia. On the cost-benefits issue, because of the inherent difficulties in determining the costs and benefits of implementing an ISO 14001 EMS, our study merely sought respondents’ perceptions as to whether or not they felt that the benefits of ISO 14001 certification actually outweigh its costs (without actually asking them for the actual costs incurred or asking for the quantum of the benefits).

4.5 Theoretical framework

The dependent variable of the ability of a firm to improve its environmental and economic performance through ISO 140001 certification is influenced by four key independent variables:

- (1) the commitment of management, especially managerial support;
- (2) the importance of culture factors (such as customer demand, society demand, past experience of ISO 9000 and employee participation);
- (3) the importance of orientation factors (such as better waste management, quality of the product and efficient production); and
- (4) the implementation cost of ISO 14001.

4.6 Hypotheses

- H1.* There is a positive relationship between a firm’s commitment to ISO 14001 and its performance.
- H2.* There is a positive relationship between a firm’s orientation to ISO 14001 and its performance.
- H3.* There is a positive relationship between a firm’s culture of ISO 14001 and its performance.
- H4.* The implementation cost of ISO 14001 is well worth the expenditure of resources, and is positively correlated with a firm’s performance

5. Methodology

The purpose of this study was to test hypotheses because we want to explain the variance in the dependent variable (a firm’s performance in terms of economic and environmental aspects) by establishing the nature of the relationship between the dependent variable and the independent variables through the testing of the hypotheses as what proposed in section 2.6. This is a correlational study because we are interested in delineating the important variables associated with the

problem. Since this is a correlational study, it is expected to be conducted in the natural environment of the organization with minimum interference from the researcher into the normal flow of work. Organizational research done in the natural environment where work proceeds normally in a non-contrived setting is in effect a field study (Sekaran, 2003).

The population of this study comprises all of the ISO 14001 certified companies operating in Malaysia that are registered under the Federation of Malaysian Manufacturers (FMM). The objective of this research study is to examine the impact of the implementation of ISO 14001 EMSs on firms' environmental and economic performance in Malaysia. Here the unit of analysis is the individual firm. The study looks at the data gathered from each firm and treats each response as an individual data source. As the number of certified firms in Malaysia is small (only 159 sites in 2004), the choice of method has to be one that allows all of the ISO 14001 certified sites to be surveyed. Since the certified sites are located all over Malaysia, a mail survey seemed to be the most appropriate method. The use of a postal questionnaire survey as a method of data collection has been very popular with researchers as it provides numerous advantages. A survey enables the collection of a sufficiently large and representative sample for analysis. Besides being simple, the postal questionnaire survey method is cost-effective and enables respondents to preserve their anonymity. Accordingly, this would make respondents feel more comfortable when answering the questionnaire.

The questionnaire consisted of three major sections. The first section gathered information about the various measurements of firms' environmental management systems based on four independent variables. This section analyzed the environmental management system and its traits by identifying 42 different dimensions. These dimensions were classified according to the four independent variables that are of interest to the study. The respondents were then asked to assess their firm's systems using a five-point scale (0 = strongly disagree; 5 = strongly agree). A five-point scale has been widely used in research studies, as this Likert scale is designed to examine how strongly respondents agree or disagree with statements in questionnaire. The second section of the questionnaire dealt with the perceived impact of the ISO 14001 certification process on firms' performance and their competitive position in the marketplace. The respondents were asked to evaluate the impact of their environmental management system on 14 dimensions of performance. Some of these dimensions focused on the core strategic areas of competition (cost, lead time, cost and market position). Others touched on areas such as reputation and customer acceptance. Still others dealt with issues of process/product design and cost/benefit assessment. Similar to section I of the questionnaire, the respondents were asked to assess the impact of their environmental management system using a five-point scale (0 = strongly disagree; 5 = strongly agree). Section III of the questionnaire focused on the demographics of respondents, including job position, years in service, the number of employees in the company, the percentage of manufactured products exported, the status of the company, and the industry type of the company.

Questionnaires were sent to all 159 certified sites (as of 2004) in Malaysia. A list of ISO 14001 certified sites was obtained from the *Directory of Malaysian Industries 2004* (Federation of Malaysian Manufacturers, 2004). Our questionnaire on the impact of ISO

5.1 Findings

A total of 151 mailings were sent out to certified firms throughout the nation. Earlier, 159 firms were identified in the study; however, after considering that a few of these are located at the same place and under the same large organization, only 151 questionnaires were sent out. Altogether, 45 sites responded to the survey, giving a response rate of 29.8 percent, a relatively high percentage for studies conducted in Malaysia. The respondents represented a variety of positions and functions including, environmental managers, quality managers, executive managers, HR managers, safety and training managers, environmental, safety and health (ESH) managers and others, "others" in this case including a HSE coordinator, an environmental engineer, a quality engineer, etc. Respondents were asked to indicate their job titles. They occupy positions ranging from executive managers to environmental engineers/coordinators and staff. This diversity argues strongly in favor of the generalizability of the results. Environmental management represented a very major portion of the respondents (18 respondents or 40.0 percent). This indicates that the survey consists primarily of users who should be able to assess ERMs and ISO 14000 as business/strategic decisions. Again, this is consistent with the objectives of this study.

A large majority (37.8 percent) of the respondents are involved in the manufacture of semiconductors and electrical goods. Of the 45 sites that responded, 30 (66.7 percent) are wholly owned by foreign companies. Of these, the majority are affiliated to Japanese companies. Only six sites belong to wholly local owned companies. The low percentage of wholly local owned companies that are ISO 14001 certified may be an interesting issue to explore, but is not pursued here. Another interesting trend is that the longer firms have been operating in Malaysia, the higher is the tendency for them to achieve ISO 14001 certification. Those have been operating for more than 20 years represent 35.6 percent of companies who responded.

5.2 Descriptive statistics

Montabon *et al.* (2000), in their survey of purchasing managers in the US, found strong evidence that certification impacts positively on performance, both environmental and economic. As can be observed from Table I (after converting the responses to means and subsequently ranking the means), enhancing the reputation of the company ranks first with a mean of 4.27 out of a possible 5 on the Likert scale. The low standard deviation indicates a general consensus amongst the respondents. Improving the company's chances of selling products internationally comes a close second, with a mean of 4.07.

Waste reduction was ranked third, with a mean of 3.98. This seems to support Rondinelli and Vastag's (2000) contention that ISO 14001 certification is not a meaningless label. Indeed, ISO 14001 certified Malaysian companies surveyed do perceive that waste is reduced, thus indicating that certification actually leads to environmental improvement and may eventually lead to increased profitability (Corbett and Kirsch, 2000). Increase customer satisfaction level and improving the company's competitive position, rank fourth and fifth respectively. Although these factors are neither quantifiable nor measurable, the results here provide an indication

Factor	1	2	3	4	5	6	7	8	9	10	11	12
1. Management commitment	<i>0.81</i>											
2. Performance tracking	0.26	NA										
3. Product acceptability	0.19	0.18	NA									
4. Documentation orientation	0.51**	0.31*	0.20									
5. Environmental management	0.71**	0.27	0.20	0.85**								
6. Process design culture	0.70**	0.18	0.21	0.56**	0.79**							
7. Supplier demand culture	0.55**	0.30*	0.17	0.69**	0.82**	0.87**						
8. Past experience of ISO 9000	0.25	0.28	0.03	0.29	0.24	0.32*	0.91**					
9. Cost of implementation	0.64**	0.39*	0.19	0.52**	0.68**	0.71**	0.21	0.55**	0.85**			
10. Perceived economic/environmental impact	0.53**	0.31*	0.31*	0.50**	0.63**	0.71**	0.44**	0.24	0.75**	0.86**		
11. Perceived customer satisfaction	0.48**	0.36*	0.33*	0.41**	0.43**	0.50**	0.48**	0.51**	0.64**	0.43**	0.68**	
12. Perceived market position	0.29	0.17	0.13	0.34*	0.46**	0.49**	.41**	0.16	0.49**	0.44**	0.30*	0.71
Mean	3.92	4.22	4.17	4.54	3.47	3.81	4.03	4.03	3.79	3.52	4.08	3.67
Standard deviation	0.68	0.79	1.13	0.56	0.83	0.71	0.97	0.73	0.72	0.67	0.70	0.92
No. of items	4	1	1	3	4	5	2	2	4	5	2	2

Notes: $n = 45$; * $p < 0.05$, ** $p < 0.01$; italicised entries are the Cronbach's alpha coefficients

Table I.
Descriptive statistics,
Cronbach's alpha
coefficients, and
zero-order correlations of
all study variables

that respondents do perceive there are benefits to certification. However, ISO 14001 certification has not significantly reduced lead times (ranked last with a mean of 3.24), or reduced overall costs (mean = 3.42; ranked 13). Our results seemed to mirror those of Montabon *et al.* (2000). They too found that ISO 14001 certification has very little impact on these measures of performance.

5.3 *Inter-correlations among the study variables*
Abbreviations were developed as summarized below:

COM_A	management commitment;
COM_B	performance tracking;
COM_A	product acceptability;
ORT_A	documentation orientation;
ORT_B	environmental management;
CUL_A	process design culture;
CUL_B	supplier demand culture;
CUL_C	past experience of ISO 9000;
COS_A	cost of implementation;
IMP_A	perceived economic/environmental impact;
IMP_B	perceived customer satisfaction; and
IMP_C	perceived market position.

Table I presents the intercorrelations and Cronbach’s alpha coefficients of all 12 factors that were derived from factor analysis. Pearson product-moment correlation was applied to investigate the intercorrelation among all study variables to be used in the hypothesis testing. Due to the fact that there is only one item each for COM_B and COM_C, reliability analysis cannot proceed for these two factors and Cronbach’s alpha coefficient is not applicable for either factor. From reliability analysis, all Cronbach’s alpha coefficients values are greater 0.60. This indicates that all items for each factor are reliable and that their internal consistency is high. The exception is CUL_C, which only achieved a value of 0.55. Although this value is low, it is still acceptable.

From bivariate correlation analysis, all dependent variables for IMP_A were significantly intercorrelated at either $p < 0.01$ or $p < 0.05$, except for CUL_C. Their intercorrelations ranged from 0.25 to 0.75. All had a positive Pearson’s correlation coefficient. Similarly, IMP_B was significantly intercorrelated with all dependent and independent variables. All were significantly intercorrelated at $p < 0.01$, except for COM_B and COM_C at $p < 0.05$. Again, all had positive Pearson’s correlation coefficients in this dependent variable. For IMP_C, it was significantly intercorrelated with all dependent and independent variables except for COM_A, COM_B, COM_C and CUL_C. Their intercorrelations ranged from 0.14 to 0.49. All COM_A, COM_B and COM_C showed an insignificant intercorrelation coefficient with their independent variables. This is understandable for both COM_B and COM_C because they have only

one item for each. Another interesting point to note was that all independent and dependent variables were positively correlated to each other; none of them had a negative Pearson's correlation coefficient.

5.4 Test for Hypothesis 1

Hypothesis 1 suggested that all dimensions of commitment to ISO 14001 were positively related to a firm's performance. All components of COM_A, COM_B and COM_C were entered as step 2, and regressed with each dimension of IMP_A, IMP_B and IMP_C. From Table II it can be seen that COM_A was related significantly to perceived economic/environmental impact ($\beta = 0.402$, $p < 0.01$) and perceived customer satisfaction ($\beta = 0.330$, $p < 0.05$), whereas COM_B was significantly related to perceived customer satisfaction and COM_C had no significant effect on the performance of any of the firms. As there were three dimensions of firms' performance that evaluated with three dimensions of commitment, therefore three sub-hypotheses were framed for this Hypothesis 1. In short, Hypotheses 1a and 1b were partially supported, whereas Hypothesis 1c was not supported, as COM_C has no significant effect on the performance of any of the firms.

As shown in Table II, the R^2 value is 0.325. This means that 32.5 percent of the variation in perceived economic/environmental impact is explained by the combination of the three independent variables, while 77.5 percent remains unexplained. The histogram of the residuals for IMP_A and IMP_B is bell-shaped, leading us to believe that the error is normally distributed. The normal p - p plot shows that the values fall along the diagonal with no extreme substantial or systematic departures; hence, the residuals are considered to represent a normal distribution. In contrast, the histogram of the residuals for perceived market position is skewed to the right-hand side, leading us to believe that the error is not normally distributed. The normal p - p plot shows that some of the values do not fall along the diagonal, with some extreme substantial or systematic departures; hence, the residuals are considered to represent a skewed distribution.

5.5 Test for Hypothesis 2

In Hypothesis 2, it was postulated that firms going for ISO 14001 certification will increase their performance due to a better orientation of ISO 14001 practices. Thus,

Step	Variables	Perceived economic/ environmental impact		Perceived customer satisfaction		Perceived market position	
		R^2	Beta	R^2	Beta	R^2	Beta
1	Control variables	0.036		0.070		0.201 *	
	Job position		-0.168		-0.123		-0.393 **
	Status of company		0.000		-0.219		-0.116
	Industry type		0.118		-0.091		-0.151
2	Main effects	0.325 ***		0.348 ***		0.066	
	COM_A		0.402 **		0.330 *		0.244
	COM_B		0.189		0.280 *		0.070
	COM_C		0.238		0.282		-0.050

Notes: $n = 45$; * $p < 0.05$; ** $p < 0.01$, *** $p < 0.001$

Table II.
Summary of regression
analysis for Hypothesis 1

components of ORT_A and ORT_B were entered in step two, and subsequently regressed with all dimensions of firms' performance. The results of the regression analysis for perceived customer satisfaction are shown in Table III. It was found that ORT_A was not significantly related to perceived customer satisfaction and perceived market position, whereas ORT_B was not significantly related to perceived customer satisfaction. Thus, all three sub-hypotheses were partially supported.

5.6 Test for Hypothesis 3

The third hypothesis of this research postulated that firms going for ISO 14001 certification would improve their performance due to better culture practices. To test this impact, CUL_A, CUL_B and CUL_C were entered in step two (after entering the control variables) and then regressed with IMP_A, IMP_B and IMP_C, respectively. A summary of the interaction results is shown in Table IV. As can be seen, Table IV indicates that only CUL_A has a significant effect related to perceived economic/environmental impact, and CUL_B has a significant effect related to perceived customer satisfaction. Thus, Hypotheses 3a and 3b were partially supported, whereas Hypothesis 3c was not supported.

Table III.
Summary of regression
analysis for hypothesis 2

Step	Variables	Perceived economic/ environmental impact		Perceived customer satisfaction		Perceived market position	
		R ²	Beta	R ²	Beta	R ²	Beta
1	Control variables	0.036		0.070		0.201 *	
	Job position		−0.168		−0.123		−0.393 **
	Status of company		0.000		−0.219		−0.116
	Industry type		0.118		−0.091		−0.151
2	Main effects	0.325 ***		0.348 ***		0.261 ***	
	ORT_A		0.245		0.360 *		0.239
	ORT_B		0.522 ***		0.267		0.361 **

Notes: n = 45; *p < 0.05; **p < 0.01; ***p < 0.001

Table IV.
Summary of regression
analysis for Hypothesis 3

Step	Variables	Perceived economic/ environmental impact		Perceived customer satisfaction		Perceived market position	
		R ²	Beta	R ²	Beta	R ²	Beta
1	Control variables	0.036		0.070		0.201 *	
	Job position		−0.168		−0.123		−0.393 **
	Status of company		0.000		−0.219		−0.116
	Industry type		0.118		−0.091		−0.151
2	Main effects	0.502 ***		0.348 ***		0.066	
	CUL_A		0.650 ***		0.286		0.404
	CUL_B		0.108		0.224		0.238
	CUL_C		−0.008		0.335 *		−0.109

Notes: n = 45; *p < 0.05; **p < 0.01; ***p < 0.001

5.7 Test for Hypothesis 4

Hypothesis 4 suggested that the implementation cost of ISO 14001 is well worth the expenditure of resources, and is positively correlated to firms' performance. In the same way, three demographic variables were entered as control variables, followed by COS_A, the implementation cost of ISO 14001, in step two. Subsequently, they were regressed with each dimension of IMP_A, IMP_B and IMP_C. A summary of the multiple regression results is shown in Table V. The summary result showed that all COS_A has a high impact on three factors of firms' performance. Thus, it is concluded that implementation cost of ISO 14001 is well worth the expenditure as it impacts positively on firms' performance. As a result, Hypothesis 4 is fully supported.

A summary of the results of the hypotheses tests is shown in Table VI.

6. Discussion

This study is intended to investigate the relationship of management commitment, orientation of EMS, culture of EMS, cost of EMS implementation with respect to firms' performance. The objective of the research is to investigate what economic and environmental impacts EMS certification has had on firms' performance. Additionally, we sought to examine the benefits of adopting the ISO 14001 standard, and to ascertain whether the benefits of EMS certification actually outweigh its implementation cost. The study found that successful attainment of ISO 14000 has a large, positive impact on the perceived efficiency and effectiveness of the EMS. Except for production efficiency and quality of products, which are not supported from hypothesis testing, ISO 14000 greatly improves every dimension of performance. This finding points to a situation where those firms that have attained this level of certification are not only more environmentally responsible but also more efficient (and potentially better suppliers).

Our study examined the impact of ISO 14001 on the economic and environmental performance of certified firms in Malaysia. Our results seem to mirror those of other studies conducted in developed countries. Specifically, the study found that ISO 14001 certification is perceived to have a positive impact on both economic and environmental performance. The sites surveyed reported enhanced company reputation as well as significant waste reduction at their plants. Thus, the argument put forth by some critics that ISO 14001 is merely a formality or an empty label that has no other benefits apart from image building and public relations is not supported by the results of our study. Further, respondents felt that putting an ISO 14001 EMS in

Step	Variables	Perceived economic/ environmental impact		Perceived customer satisfaction		Perceived market position	
		R^2	Beta	R^2	Beta	R^2	Beta
1	Control variables	0.036		0.070		0.201 *	
	Job position		-0.168		-0.123		-0.393 **
	Status of company		0.000		-0.219		-0.116
	Industry type		0.118		-0.091		-0.151
2	Main effects	0.563 ***		0.357 ***		0.196 **	
	COS_A		0.780 ***		0.621 ***		0.460 **

Notes: $n = 45$; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

Table V.
Summary of regression
analysis for Hypothesis 4

Table VI.
Summary of results

Item	Hypotheses	Result
1	<i>H1</i> . There is a positive relationship between commitment to ISO 14001 and a firm's performance <i>H1a</i> . Commitment to ISO 14001 is positively related to perceived economic/environmental impact <i>H1b</i> . Commitment to ISO 14001 is positively related to perceived customer satisfaction <i>H1c</i> . Commitment to ISO 14001 is positively related to perceived market position	Partially supported Partially supported Not supported
2	<i>H2</i> . There is a positive relationship between a firm's orientation towards ISO 14001 and its performance <i>H2a</i> . Orientation of ISO 14001 is positively related to perceived economic/environmental impact <i>H2b</i> . Orientation of ISO 14001 is positively related to perceived customer satisfaction <i>H2c</i> . Orientation of ISO 14001 is positively related to perceived market position	Partially supported Partially supported Partially supported
3	<i>H3</i> . There is a positive relationship between a firm's culture of ISO 14001 and its performance <i>H3a</i> . Culture of ISO 14001 is positively related to perceived economic/environmental impact <i>H3b</i> . Culture of ISO 14001 is positively related to perceived customer satisfaction <i>H3c</i> . Culture of ISO 14001 is positively related to perceived market position	Partially supported Partially supported Partially supported
4	<i>H4</i> . The implementation cost of ISO 14001 is well worth the expenditure of resources, and is positively correlated to a firm's performance	Fully supported

place has led them to explore alternative technologies and procedures in their production processes. They also perceived that the benefits of certification far outweighed its costs. While all these seem to speak well for ISO 14001, our findings also revealed some negative aspects. Instituting an ISO 14001 EMS did not help management reduce lead times or costs or lead to quality improvements. Additionally, to improve the quality of our environment there needs to be a partnership between government, businesses and the community. Most importantly, there should be a fundamental change in attitude to ensure better environmental performance. In other words, one needs to personalize one's approach to the environment (Avila and Whitehead, 1993).

The relationship between environmental systems, economic/environmental performance and overall firm performance is not clear. Some writers, such as Porter and Van der Linde (1995), have argued that by becoming more environmentally responsible, firms also uncover new sources of waste and productivity. The result is that enhanced environmental responsibility results in improved corporate performance. Other writers, primarily Walley and Whitehead (1994), argue that this is not the case. In most instances, improved environmental performance comes at the

cost of reduced profitability and reduced shareholder value. One-way of evaluating the nature of this relationship is to ask respondents to assess the impact of their environmental management systems on several critical dimensions of their firms' performance. To this end, a section was included that focused on this specific aspect of performance. The respondents were asked to evaluate the impact of their environmental management systems on 14 dimensions of performance. Some of these dimensions focused on the core strategic areas of competition (cost, lead-time, and market position). Others touched on areas such as reputation and customer acceptance. Still others dealt with issues of process/product design and cost/benefit assessment.

As can be seen from descriptive analysis, the study observed high standard deviations associated with the means: there is a fair degree of difference in the positions taken. However, a study of the mean responses reveals a mixed picture of the impact of an EMS on overall firm performance. At best, environmental systems have caused managers to explore more options when dealing with problems, especially problems involving new technologies and procedures. Further, these systems have not compromised product acceptance and corporate position in the marketplace. However, these systems have not helped management to reduce lead-times, improve quality, or reduce costs – the primary factors that shape a firm's competitive position in the marketplace. Lastly, it is important to point out that unless management and employees believe in the certification process, the chances of success may be slim. A target of zero emissions creates a distinct corporate culture and a policy focus that will guarantee environmental improvement (Clark, 1999). However, this may not be achieved without the commitment of top management. A major effort in identifying, measuring and reporting environmental impacts begins with the CEO (Epstein and Roy, 1998).

Governments, too, have an important role to play. To support an enhanced level of environmental proactivity, governments should provide for regulatory incentives. Essentially, the way governments set policy and impose taxes should help efforts towards the greening of the environment. For example, support from governments in the form of grants (particularly for small and medium-sized enterprises) to gain certification will contribute towards an improved environment. In Taiwan, the Industrial Development Bureau contributes between 40 and 60 percent of ISO 14001 preparation costs for about 50 SMEs annually (Corbett and Kirsch, 2000). Another is through the provision of tax relief ("green tax") given to companies that are ISO 14001 certified. Providing incentives for companies to implement EMS voluntarily is relevant. It has been claimed that providing tax relief would be the most powerful tool in encouraging companies to be environmentally responsible (Steger, 2000). In Malaysia, for example, the government provides incentives in the form of subsidies for using unleaded petrol and natural gas. While the "green tax" acts as a positive reinforcement, countries worldwide have also resorted to the punitive method of ensuring that companies act responsibly towards the environment. With the increase in the amount of legislation pertaining to the environment and hefty increases in fines for violators, it is hoped that there will be an improvement in environmental performance. Most importantly, enterprises must realize that being environmentally responsible pays.

7. Future research

Further, while the empirical results may be interesting, the findings represent an exploratory area of research, which ultimately needs to be grounded in theory. To this end, DiMaggio and Powell's (1983) institutional theory may provide an *ex post* explanation of the results obtained here. According to this theory, pressures exerted on organizations by other organizations upon which they are dependent may have a significant influence on the manner in which corporations act. For example, the study found that the firms surveyed indicated that a specific directive from headquarters brought about ISO 14001 certification, thus supporting the theory of coercive isomorphism. This was evidenced by the fact that most respondents were wholly owned foreign companies, with the majority being in Japanese, US or UK ownership. Additionally, the incentive to seek certification can, to some extent, be explained by legitimacy theory. Legitimacy theory postulates that an implicit agreement exists between society and organizations, under which the latter are allowed to continue operations as long as they are seen to satisfy specific societal needs (Deegan and Gordon, 1997).

From a legitimacy theory perspective, the results in Table IV may be interpreted as supporting the notion that ISO 14001 certification is primarily driven by a need to maintain the public perception of good environmental management. Finally, prior research has consistently found that a strong environmental performer is also one that has a strong bottom line (Lovins *et al.*, 1999). In line with this, stakeholder theory may also help illuminate the relationship between corporate environmental performance and economic performance. From the perspective of stakeholder theory, a company is implied to have contracts with multiple stakeholders. A tenet of the theory asserts that shareholders (deemed the dominant stakeholder group) will benefit financially when management meets the demands of multiple stakeholders. To this end, and in the context of EMS, separating self-interest and environmental responsiveness may prove difficult as both sets of motivations can lead to positive outcomes for both the stakeholders and the firm (see Ruf *et al.*, 2001). Future research on EMS should incorporate the theories just mentioned so that a more comprehensive theoretical framework can be developed.

8. Conclusion

Overall, this study has provided some empirical evidence that ISO 14001 certification has a positive impact on firms' performance, specifically on perceived economic impact, perceived environmental impact and perceived customer satisfaction. One very important element of ISO 14001 is that the EMS must continually improve. In essence, the standard requires sound environmental management to be a way of travelling, and not a destination. ISO 14001 adds value to an EMS, even a mature one, as a continual improvement activity. Although ISO 14001 is not the only way to manage environmental affairs effectively, and registration to ISO 14001 does not itself guarantee outstanding business results, our study has shown that it has in fact had a strong impact on and provided benefits for the overall position of the company.

By failing to perceive a marketing opportunity from using this well-known standard, firms can lose their market share. In addition, consumers should be made aware of these programs, especially in the case of environmental labels. These labels should be placed where they are visible to the consumer in order to influence purchase

decisions. Firms should want to participate voluntarily in the certification process mainly to be able to appeal to this segment of consumers. While the success of this program brings many benefits, both environmentally and economically, that success will depend on how much a firm is willing to invest in time and resources. Like all good investments, if cultivated well, it may be suggested that the ISO 14000 standards can garner substantial dividends in the long run.

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