PERGAMON

Omega 29 (2001) 525–542

omega
The International Journal of Management Science

www.elsevier.com/locate/dsw

Motivation for ISO 14000 certification: development of a predictive model

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Received 2 February 2000; accepted 6 June 2001

Abstract

Environmental issues have become critical concerns of businesses in recent years. The Singapore Environment Ministry is urging organizations to consider adopting the ISO 14000 Environmental Management Standards. The main purpose of this study was to investigate and identify a number of variables which would be able to predict the motivation of organizations in adopting the ISO 14000 Standards. Through extensive literature search eight possible predictive variables/factors (cost savings, top management concern, employee welfare, meeting environmental regulations, meeting customer expectations, concern over trade barriers, following head office environmental practices, and gaining competitive advantages) were identified. In total, 300 pre-tested survey questionnaires were mailed out to companies from the Electronic and Chemical industries in Singapore. A response rate of about 20% was obtained. The survey instrument was tested for reliability and validity. Using stepwise discriminant analysis, a predictive discriminant function was developed. Only four out of the originally identified eight variables were included in the model. Possible benefits of such a model for Singapore and other industrializing countries are highlighted.

Keywords: Environmental management system (EMS); Predictive model development; Discriminant analysis; ISO 14000 standard; Singapore; Electronics industry; Chemical industry

1. Introduction

An enduring society must be based on a system of commerce and production that is sustainable and restorative [1]. Sustainable development is an approach that uses the earth resources in such a way that future generations' needs are not compromised. In other words, sustainable development seeks a balance between economic growth and environmental protection. This implies that countries and businesses need to integrate economic, biologic, and human systems to create a sustainable system of commerce, and that governments need to incorporate flexibility that rewards proactive environmental management. As we approach the 21st century, it is clear that new ways of thinking are needed to tackle the environmental and societal issues that face our global community. The consequences of not managing the organizational environment properly may result in severe pollution and other related problems, which may kill thousands of people and damage the physical environment [2]. For example, in the last quarter of century there were a number of large-scale industrial disasters which spurred global concerns about industry's impact on the environment and motivated the international community to consider new ways of preventing pollution. Events such as the chemical disaster in Bhopal, India, the radiation release in Chernobyl, USSR,

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0305-0483/01/$ - see front matter
PII: S0305-0483(01)00042-1

the oil spilled by Exxon Valdez off the coast of Alaska, the fire at a warehouse of a chemical manufacturer at Basel, Switzerland, and many others [2–4] raised global concerns about industry's impact on the environment and generated global interest in preventing pollution [5].

Environmental management attracted interest only in the 1970s. For example, the first European Community Directive pertaining to the disposal of waste oil was issued in 1975. This was followed by subsequent directives covering toxic waste, dangerous waste, titanium oxide and pollution of water and air [6]. Following the 1980 Earth Day, the publication of the United Nations' Brundtland Report in 1987, highlighted that though economic growth has been the cause of much environmental damage, economic development is necessary to remove poverty. The report further suggested the adoption of sustainable development as a solution to attain both economic and environmental goals [4]. This triggered a philosophical change from the "anti-growth" perspective of the 1970's environmentalists to one of "sustainable development" [7]. As a result of the Brundtland report, the Earth Summit in June 1992 (also known as the United Nations Conference on Environment and Development) was held in Rio de Janeiro and was attended by heads of states and leaders of 170 nations [6]. The Earth Summit covered areas such as biological diversity, climate change and a detailed blueprint for implementing sustainable development based on 27 principles known as the Rio Declaration [7]. Furthermore, environmental standards were prepared in order to guide businesses in their efforts to set up environmental management systems and also to provide an objective measure to determine the appropriateness of the different environmental management systems set up by business enterprises [5].

Besides governmental efforts in environmental management, businesses are also starting to focus on environmental issues. For instance, the Business Council for Sustainable Development (BCSD) was established in 1991 with a total of 48 members. Its main mission was to provide a business input during the Rio Conference. Its members are heads of major global companies like Dow, Dupont, Ciba-Geigy, Shell, Chevron, Trans Alta Utilities, Nippon Steel, ALCOA, Volkswagen and Nissan. The principle of eco-efficiency, which describes the practice of adding most value with the least use of resources and the least pollution, was developed. Based on this principle, BCSD believes that corporate environmentalism will lead to competitive advantage and increasing profitability [8]. Codes of environmental behavior for businesses have also been developed in recent years, most notably, the Coalition for Environmentally Responsible Economies (CERES) Principles and the Business Charter for Sustainable Development (BCSD). With the Exxon Valdez oil spill incident as the triggering effect, the CERES principles were released in 1989. The CERES principles promote responsible economic activity for a safe, just and sustainable future. Signatories to the CERES principles include companies like the Sun MicroSystem, General Motors and Ben & Jerry's [9]. In 1990 the International Chamber of Commerce also developed a set of 16 guiding principles known as the Business Charter for Sustainable Development or the Global Environmental Management Initiative (GEMI) Principles [10] and over 1000 companies have since endorsed the charter [9].

A number of empirical studies have also concluded that adopting environmental management does bring certain advantages for businesses. For instance, Klassen and Whybark [11] concluded that improved manufacturing performance could occur simultaneously with investments that improve environmental performance; Russo and Fouts [12] confirmed that high levels of environmental performance were associated with enhanced profitability. Furthermore, they also concluded that as industry grows, environmental performance would have a greater positive impact on firm profitability. Klassen and McLaughlin [13] concluded that both environmental performance and firm performance are positively linked. Finally, Sharma and Vredenburg [14] concluded that proactive measures in environmental responsiveness is associated with the emergence of organizational capabilities and that had no negative impact on corporate competitiveness [5].

Companies are realizing that proactive environmental management can prevent such disasters and result in a more effective organization with an improved bottom line. The best-managed companies have demonstrated that implementing an environmental management system can produce significant increases in productivity and profitability [15].

1.1. What is ISO 14000?

The ISO 14000 standards are international voluntary, consensus standards [2]. These standards were developed by the International Organization for Standardization (ISO), located in Geneva, Switzerland, is a non-governmental, international organization. The goal of the ISO is to develop standards on a worldwide basis to allow commerce to transcend national boundaries without creating trade barriers. The standards are process oriented; they do not establish goals or limits. Instead, they establish management system guidelines that help organizations ensure compliance with customer, industry, or regulatory limits.

The early 1990s saw developments in the area of Environmental Management Systems (EMS). BS7750, the British Standards for EMS was introduced in 1992, and revised in 1994. Concurrently, the work on the European Union's environmental standard for companies began, and led to the launch of the Eco-Management and Audit Scheme (EMAS) in 1993 [2,16].

In 1993, the ISO established a Technical Committee (TC207) to develop and produce a set of unified, voluntary standards for environmental management that could be accepted and implemented worldwide. ISO 14000 has been developed to help any company in any country to meet the goal of "sustainable development" and environmental

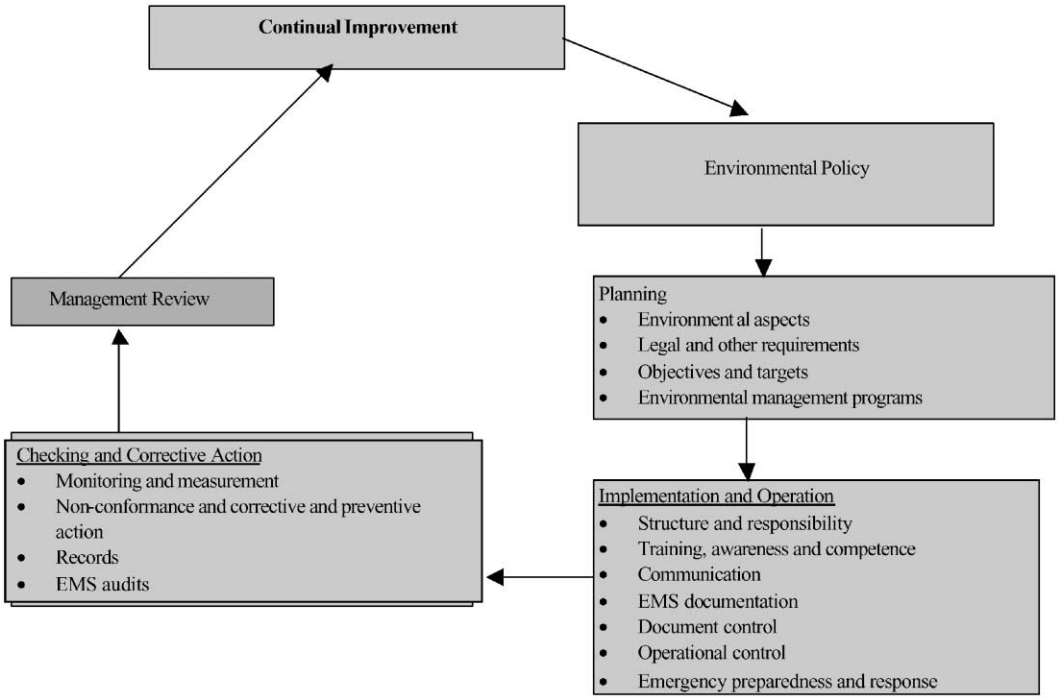

Fig. 1. Environmental management system model. Source: Adapted from Ritchie and Hayes, [2, p. 20].

friendliness. The ISO 14000 family of standards (i.e., ISO 14001—Environmental Management Systems: specification with guidance for use, 14004—Environmental Management Systems: general guidelines on principles, systems and supporting techniques, 1410—Guidelines for Environmental Auditing: general principles, 1411—Guidelines for Environmental Auditing: Audit procedures and 1412—Guidelines for Environmental Auditing: qualification criteria for environmental auditors) were published as an official document in late 1996. Other standards related to the family (ISO 14024—Environmental labeling, ISO 14040—Life cycle assessment and ISO 14060—Guide for the inclusion of environmental aspects in product standards) were not issued in final form at that time.

The ISO 14000 series aims to provide guidance for developing a comprehensive approach to environmental management and for standardizing some key environmental tools of analysis such as labeling and life cycle assessment. The standards are non-prescriptive. They are meant to be complementary to national regulatory regimes and are not intended to replace or duplicate a country's regulatory system [2,16].

The ISO EMS consists of 5 principles as shown in Fig. 1:

- Environmental policy
- Planning
- Implementation and operation
- Checking and corrective action
- Review and improvement

1.2. Relationships between ISO 14000 and ISO 9000

ISO 9000 was released to the world in 1987 and was subsequently revised in 1994. At first , a few companies were certified as many companies were already registered to their respective national standards for management systems of quality assurance, such as BS5750. However, when the European Union regulations started to indicate ISO 9000 as a faster way to get easier access to their markets, and when specific industries started asking their suppliers for conformance, the use of ISO 9000 exploded [16]. For example, in 1990, only a handful of companies were ISO 9000 registered but by 1995 more than 6000 companies were registered, with more than 20,000 in line to be registered. The largest of this were the automotive and defense industries.

Clements [16] argues that the concept of an environmental management system, specially one designed to dovetail into ISO 9000, has considerable merit. He further argues that the exploding use of ISO 9000 is an indication of the possible path of growth for ISO 14000.

There are regulations in force in the European Union to enforce the use of ISO 14000. Also there is a growing interest for companies to demonstrate that their products are "green". Clement [16] claims that as with ISO 9000, virtually any company can use ISO 14000 standard. It is to be noted that like ISO 9000, the ISO 14000 standard was developed using the same technical system. The second revision of ISO 9000 has been published in 2000. This revision

broadens the ISO 9000 family of standards to include portions of other management issues, such as health, safety, finance and the environment. To quote from Clements [16]—"*This means that ISO 14000 will move from being a cousin of ISO 9000 to being a full sister to the standard*".

Further examination of the details of the two standards it would reveal that there are similarities in structure and content of the clauses of both the standards [2, pp. 21–22].

1.3. The extent of adoption of ISO 14000 standard in Singapore

The Singapore Green Plan has been developed as the blueprint for environmental management and protection [17]. It includes a comprehensive range of programs to encourage both the corporate sector and the community to play a more proactive role in environmental protection. The environmental management strategy that has been adopted is based on the principle that 'prevention is better than cure'. The key elements in this strategy include planning control, provision of environmental infrastructure, setting and maintaining an effective institutional and legal framework and implementing a comprehensive monitoring system such as ISO 14000 [18].

As in the case of ISO 9000 standards the ISO 14000 series have attracted a lot of attention in Singapore. The lSO 14000 guidelines would serve as a useful structure for firms wanting to improve their environmental management system. Multinationals like Sony Display Devices, IBM, Philips, Sieko Instruments and Baxter Healthcare have had their operations certified as being lean and green. Among the local companies Singapore Airlines and Stamford Press are the pioneers in this respect. As of early 2000 about 170 companies have already been certified under the standard. Sony Display Devices and Baxter Healthcare were the first two companies being certified in Southeast Asia [19].

Organisations with Environmental Management System (EMS) in place have reported having benefited from implementing such a system [20–22]. Firstly, the image of the organisation as being environmentally responsible is enhanced. Stakeholders are assured of the organization's commitment to demonstrable environmental management. This helps to maintain good public and community relations. In addition, there is potential cost savings from resource conservation and waste minimization. For example, Sony Display Device saved S$ 10 million in 1995 by cutting chemical usage, conserving water and electricity and re-using packaging materials [19,23].

Both Sony Display Devices and Baxter Healthcare were part of a pilot scheme that was started by the Singapore Productivity and Standards Board (PSB) in December 1995 to help organisations prepare for ISO 14000 certification. The structured EMS approach also ensures legislative compliance. Organisations with a good track record of legislative compliance will have less intervention from regulatory bodies and fewer incidents that result in liability. Furthermore, implementation of such a system would possibly help improve industry–government relations. This also often results in insurance premiums being lower [19].

From literature review, it is observed that no study has been reported on the development of a predictive model to identify the companies that may be the candidates for ISO 14000 certification. Therefore, the primary objective of this study is to identify a set of possible variables and then developing a model to predict whether an organization would be motivated in adopting the ISO 14000 standards.

The above objective is especially important for the government of Singapore. As indicated earlier, the government's "Green Plan" includes a comprehensive range of programs to encourage both the corporate sector and the community to play a more proactive role in environmental protection. The findings of the study would help the government design and implement various incentives schemes and other appropriate measures for organizations to adopt the standard. It is expected that such adoption in turn would help realize the "Green Plan". Information on Singapore Government's plans and schemes to assist organizations to get ISO 14000 certification is presented in Section 7.4.

2. Literature review and hypothesis development

Much of the literature to date has been descriptive; in particular, describing commonly used environmental management practices and the impact of an environmental strategy on the company's business strategy. For example, Gupta [24] studied the impact of environmental management on the operations function. Garrod and Chadwick [25] discussed the linkage between environmental management and business strategy. Makower [26] discussed the issues related to economic benefits to the environmentally responsible businesses, and Soderbaum [27] reported on decision-making approaches in environmental management. Halkik [28], Hormozi [29] and Wu and Tan [30] discussed the various issues related to ISO 14000. Soh [15,31], Klassen and McLaughlin [13] and Quazi [32] discussed the impact of implementation of environmental management system. Maxwell et al. [33], Newman and Breeden [34], Russo and Foust [12] and Decant and Altman [35] discussed issues related to environmental leadership, corporate environmental strategies, and environmental performance and profitability and Schmidheiny [8] discussed the issues related to sustainable development. It is to be noted that none of these studies attempted to develop a model for predicting the intentions of a company to be ISO 14000 certified. This study aims to fill this void in the literature.

A number of publications on the adoption of ISO 9000 quality standards by companies were reviewed to explore the possibility of drawing analogy for ISO 14000 standards. The findings of this review is summarized below.

Flynn et al. [36] explored the relationship of specific quality management practices to quality performance. The study

focused on both core quality management practices and on the infrastructure that creates an environment supportive of their use. Frost and Jones [37] examined why organizations sought ISO 9000 certification; why they chose a particular accreditation body and the benefits they had obtained as a result. Terziovski et al. [38] examined the efficiency of ISO 9000 certification by testing the relationship between certification practice and customer satisfaction as perceived by senior management in Australia and New Zealand manufacturing operations. The present study on the adoption of ISO 14000 was designed drawing from the works cited above. The development of the hypotheses is discussed in Section 2.1 below.

2.1. Constructs and hypotheses

H1: Plan to adopt ISO 14000 is motivated by a genuine concern of top management for the environment.

A study by Gupta [24] reported that 92% of the 400 CEOs and top executives surveyed agreed that the environment challenge was one of the central issues of the 21st century. Flyn et al. [36] argued that without strong top management support, the core practices of an organization would be ineffective. Hunt and Auster [39] identified top management support as one of the seven elements that a proactive company should have with regard to environmental management. Berry and Rondinelli [40] also identified top management leadership as one of the six critical elements that was required to create an effective proactive environmental management. Similarly, Epstein [9], Makower [26], Cairncross [41], Welford [42], Newman and Breeden [34], Gyler [43], and Kuhre [44] had also emphasized the need for top management support as one of the critical success factors in the implementation of Environmental Management System, ISO 14000.

H2: Plan to adopt ISO 14000 is motivated by the potential cost savings that could be gained.

Jaggi and Freedman [45] examined the association between pollution performance and economic and market performance of industrial organizations. The economic performance was found to be negatively associated with pollution performance over a short period of time. Market performance, as measured by the Price–Earnings ratio was also found to be negatively associated with pollution performance. Huges [21] argues that a good EMP cam pinpoint opportunities for cost savings in the areas of raw materials, waste minimization or elimination of pollution, energy efficiency. A study of five ISO 14000 companies in Singapore indicated that in the long run the benefits of the implementation of the EMS far exceeds the costs [32].

H3: Plan to adopt ISO 14000 is motivated by a need to ensure good employee welfare in the area of environmental health.

A study of McKinsey covering 403 senior executives from around the world revealed that 68% of them agreed that organisations with a poor environmental record would find it increasingly difficult to recruit and retain high caliber staff [46]. Division Director of Environmental Affairs for Dexter Corporation further validated that point suggesting that 'college graduates were looking for more than just a pay check, they were looking for companies with which they could identify with morally and philosophically' [35].

A study by the Asia Environmental Office of Sony International showed that the introduction of Environmental Management System had a positive effect on staff recruitment which, helped attract capable employees [23].

H4: Plan to adopt ISO 14000 is motivated by the need to meet Singapore's environmental regulations.

Singapore has tough environmental laws, which are enforced strictly. Industries are required to install in-house treatment facilities to recycle their toxic wastes to treat them for safe disposal [1, p. 61]. The Environmental Public Health (Toxic Industrial Waste) Regulations were introduced by the Singapore Government under the Environmental Public Health Act to control the collection, transportation and disposal of toxic industrial waste. Under these regulations, a licensing and approval system was implemented to control firms that are involved in such activities. The Ministry of Environment also monitors the emissions and discharge of pollutants by industries, which is carried out through self-monitoring system imposed on industries and by conducting spot checks and sampling [17, pp. 4, 6].

H5: Plan to adopt ISO 14000 is motivated by the need to meet customers' expectations.

Saraph et al. [47] reported that ISO 9000 certification was positively related to customer satisfaction. Johnson [48] argued that ISO14000 would make a good business better, maintaining good public/community relation and enhancing image and market share.

A 1990 Gallup poll found that 52% of those surveyed stopped buying products from companies with a poor environmental image. Another survey showed that citizens in 24 industrialized and developing nations considered environmental prevention to be more important than economic growth [20]. It is argued that establishing a strong environmental image can help attract environment conscious customers and create pressure on competitors.

Businesses are becoming increasingly conscious about environment management. They now prefer to use suppliers with good environmental records. The customer, conscious of his/her reputation and environmental compliance requirements, often chooses to use suppliers and sub-contractors who can demonstrate satisfactory environmental performance [49].

ISO 14001 adds to the credibility of an EMS because an independent auditor must certify a company. Customers are beginning to request that suppliers become certified as a contractual requirement. Companies are being asked by customers or purchasers of their product and service to become certified to ISO 14001 as a prerequisite to placing a purchase order [9,50].

H6: Plan to adopt ISO 14000 is motivated by the potential impact of environmental trade barriers.

Implications of ISO 9000 certification in developing countries and those in transitional economies have been found to be mixed [51, p. 21]. On the positive side, it was found that there was a common perception that ISO 9000 certification would help to expand international trade. On the negative side, the rising requirements of ISO 9000 certification, particularly from importers in industrialized countries, is viewed as a potential barrier to trade. The same study found that the large exporters were the main beneficiaries of the ISO 9000 trade expansion effects.

In case of trade implications of ISO 14001, more than half of the respondents from companies and business associations found that foreign environmental standards already hindered export opportunities [51, p. 43].

H7: Plan to adopt ISO 14000 is motivated by a need to follow Head Office environmental practices.

The pressures to introduce TQM in the organization came from two basic sources. The first source of pressure was the corporate headquarters and the second from the leading customers who have already introduced TQM programs. Such customers are increasingly demanding the same of their suppliers [52]. Similar situation may follow in the case of ISO 14000 standard. For example, 3M is enhancing and integrating a global environmental management system, which it expects all her subsidiaries to follow as well [53].

H8: Plan to adopt ISO 14000 is motivated by competitors' intention to adopt ISO14000.

At the corporation level, management feels threatened when they realize that their business rivals are incorporating environmental issues into their strategic plans before themselves. Some argue that companies, which fail to observe the green ethic, would lose out on opportunities in the market place [54].

Companies that are ISO 14001 certified are expected to have an advantage over non-certified companies when selling to industrial or government consumers. Studies have shown that ISO 9001 certified Japanese companies performed better in the European markets than their counterparts without certification. This trend is expected to repeat for ISO 14001 [22].

The above discussion on the sphere of influence and interest surrounding ISO 14001 certification is summarized in Fig. 2.

This framework provides an overview of influencing factors leading to the adoption of ISO 14001 EMS certification for most of the local and foreign firms in Singapore.

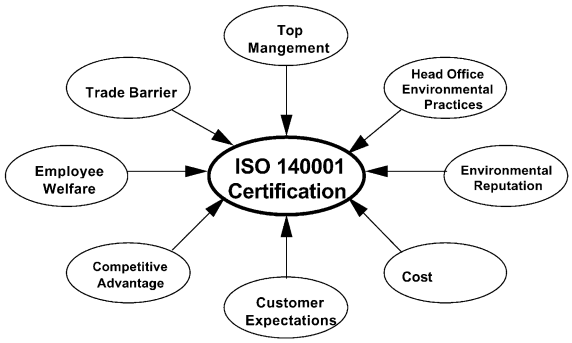

Fig. 2. The sphere of influence and interest surrounding ISO 14001 certification.

Table 1
Grouping of the statements under respective hypothesis and the outcome measurers

Hypothesis	Factor	Statement no.
H1	Top management	1, 6, 7, 8 and 14
H2	Cost savings	2, 10, 11 and 36
H3	Employee welfare	15, 16, 17 and 18
H4	Environmental regulations	13, 20, 21 and 22
H5	Meet customer expectations	5, 23, 25 and 26
H6	Trade barrier	3, 28, 29, 30 and 31
H7	Head-office environmental practices	4, 9, 19, 33 and 35
H8	Competitive advantage	27, 32, 34 and 37

3. Survey instrument

Keeping in view the above discussions and the hypotheses, a questionnaire was developed consisting of 37 items. The respondents were asked to rate these statements on a five-point Likert scale where, 1 = strongly disagree and 5 = strongly agree. Of these 37 items one (item 12) was designed to capture information related to the outcome of the implementation of the environmental management system. In addition to the statements addressing the issues related to the hypotheses, the respondents were also asked to provide information related to ISO 14001 Certification status and the intention to get certified. Background information on their respective organizations were also requested. A copy of the questionnaire is attached in Appendix 1.

To minimize response bias, the statements were randomly mixed-up (i.e., statements belonging to a particular hypothesis were not grouped together). However, at the time of data analysis statements belonging to each of the hypotheses were grouped together and analysed accordingly. Table 1 shows the grouping of the statements under respective hypothesis.

4. Analysis and findings

4.1. The sample

The Electronic and Chemical industries in Singapore were the targeted participants as they contributed to more than

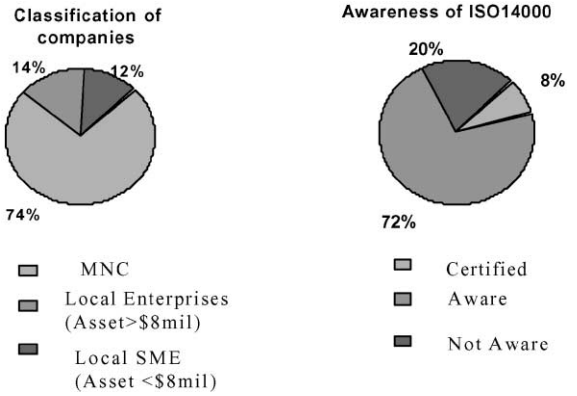

Fig. 3. Profile of the responding companies.

70% of Gross Domestic Product. It also generates huge amount of wastes and pollutants that must be managed and controlled. Three hundred survey forms were sent out to the companies selected randomly from the "Directory of Chemical Manufacturers and Support Services" and the "Electronics Trade Directory". Follow up calls were made to the sample companies to improve the response rate. Sixty-one companies responded to the survey (response rate of about 20%). Questions that were not answered were treated as "missing data" and excluded from the analysis.

4.2. Profile of the responding companies

Forty percent of the respondents (Fig. 3) were chemical companies and 60% electronics companies. 74% were foreign multinational corporations, 14% were local small-medium enterprises with net asset less than S$8 million and 12% were local enterprises. Seventy-two percent were ISO 9001/2 certified. Eighty-one percent were aware of standards though only 8% were certified. Fifty-four percent indicated their intention to adopt ISO14001.

4.3. Reliability and validity of empirical measurements

4.3.1. Measurement of internal consistency

Cronbach's alpha was computed to measure the internal consistency of the construct. A cut off point of 0.6 was used as the minimum [55]. The Cronbach's alpha values that were obtained ranged from 0.50 to 0.88 (Table 2). To enhance the internal consistency, one item each from hypotheses 4 and 5 were deleted.

4.3.2. Content validity

Content validity is not evaluated numerically—it is subjectively judged by the researchers [47]. It is argued that the hypotheses developed in this study have content validity since the selection of measurement items was based on both an exhaustive review of the literature, detailed evaluations by the researchers and the practicing managers. For example, the instrument was pre-tested by managers of five ISO 14000 certified companies. The pre-test subjects indicated that the content of each hypothesis was well represented by the measurement items employed.

Table 2
Test for internal consistency

Hypothesis	Cronbach's alpha	Item(s) # removed	Cronbach's alpha [after the removal of one item]
H1	0.78		—
H2	0.69		—
H3	0.62		—
H4	0.54	21	0.67
H5	0.50	23	0.64
H6	0.64		—
H7	0.88		—
H8	0.66		—

Table 3
Construct validity

Hypothesis	Extraction sums of squares loading		
	Compo-nent-1	Compo-nent-2	Cumula-tive %
H1	57.6	—	57.6
H2	51.9	—	51.9
H3	47.3	—	47.3
H4	60.5	—	60.5
H5	52.3	—	52.3
H6	42.9	22.01	65.0
H7	67.9	—	67.9
H8	53.0	—	53.0

4.3.3. Construct validity

The construct validity of each factor measure was evaluated by factor analysis. Each measure was assumed to be a separate construct. The result showed that seven out of the eight factors were unifactorial. Hypothesis six (i.e., the potential impact of environmental trade barriers that will lead to the adoption of ISO 14001) had two factors. The five questions in this hypothesis deal with the issue of environmental trade barriers and the way the organization perceives it. An analysis of the questions does not readily give an impression of why they should be grouped into two different factors. Table 3 presents the summary result of the factor analyses.

4.3.4. Criterion validity

Criterion-related validity, sometimes called predictive validity or external validity, is concerned with the extent to which a measuring instrument is related to an independent measure of the relevant criterion. The eight measures of motivation for ISO 14000 certification in a business unit have criterion-related validity if these measures (collectively)

are highly and positively correlated with the environmental management performance of the business unit/company. In other word, these measures taken together should account for the performance of the business unit/company with respect to the outcome of ISO 14000 certification of that business unit/company [47].

The criterion-related validity of the combined set of eight motivational factors of ISO 14000 certification was evaluated by examining the multiple correlation coefficient computed for the eight measures and a measure of business unit environmental performance. As indicated in Section 3, one measure of environmental performance was obtained from the sample managers. Each manager was asked to rate the statement—"*our organization has already reaped monetary benefits from its environmental programs*" (statement 12 of the questionnaire) on a 5-point scale to reflect the outcome of the implementation of the environmental management system.

These subjective measure was chosen over an objective one because of the difficulty in identifying and obtaining an objective measure that would be appropriate for the different types and sizes of businesses in the sample (for further elaboration on this point, refer to Section 7.2). The multiple correlation of the environmental performance measure (dependent variable) and the eight factors of motivation for ISO 14000 certification (independent variables) was 0.679 ($R^2 = 0.46, F = 4.695, p < 0.001$), indicating that the eight factors have a high degree of criterion-related validity when taken together.

5. Multiple discriminant analysis

Discriminant analysis, which involves deriving the linear combination of the independent variables that will discriminate best between a priori defined groups, was used to estimate the relationship between a single nonmetric dependent variable and a set of metric independent variables. The primary objective is to identify the group to which an organization belongs—yes, no, to ISO 14001 certification.

5.1. Adequacy of the sample size

Discriminant analysis is quite sensitive to the ratio of sample size to the number of predictor variables. The minimum size recommended is five observations per independent variable [56, p. 258]. This study has a 6.6:1 ratio of observations to predictor variables, which meets the 5:1 ratio recommended. In addition to the overall sample size, the sample size of each group should also be considered. At a minimum, the smallest group size must exceed the number of independent variables [56, p. 258]. In this study there are a total of 53 valid responses of which 32 'yes', 11 'no' and 10 'unsure'. As there are 8 independent variables, all groups satisfy this criterion. Discussion on issues related to sample size and power is presented in Section 7.1.

Table 4
Skewness values

Group mean for hypothesis	Skewness	Z
H1	−0.324	−0.991
H2	−0.460	−1.41
H3	0.212	0.648
H4	0.093	0.284
H5	−0.251	−0.767
H6	−0.093	−0.284
H7	−0.154	−0.470
H8	−0.114	−0.348

Table 5
Testing for multi-collinearity

Variable	Tolerance	VIF
H1	0.281	3.560
H2	0.447	2.235
H3	0.602	1.660
H4	0.531	1.883
H5	0.372	2.687
H6	0.624	1.603
H7	0.255	3.915
H8	0.376	2.661

5.2. Assumptions of discriminant analysis

Hair [56] suggests that it is desirable to meet certain conditions (i.e., multivariate normality and multivariate collinearity) for proper application of discriminant analysis. In the following sections multivariate normality of the independent variables and lack of multi-collinearity among independent variables are examined.

5.2.1. Test for normality

It is argued that data not meeting the multivariate normality assumption can cause problems in the estimation of the discriminant function. The skewness value was used to assess the normality. If the 'z' exceeds 1.96, we can reject the assumption about the normality of the distribution at the 0.05 probability. From Table 4 below it is seen that all data means have a normal distribution since there is no 'z' value that exceeds 1.96.

5.2.2. Test for multi-collinearity

Two of the more common measures of assessing multiple variable collinearity are (1) the "tolerance" value and (2) its inverse—the "variance inflation factor" (VIF). These measures indicate the degree to which each independent variable is explained by the other independent variables. Tolerance is the amount of variability of the selected independent variable not explained by the other independent variables. Thus very small tolerance values (and large VIF values) denote high collinearity. A common cutoff threshold is a tolerance value of 0.10 which corresponds to VIF values above 10. From Table 5 it can be concluded that the tolerance and VIF

Table 6
Two-group discriminant analysis

Dependent	H1	H2	H3	H4	H5	H6	H7	H8	Sample
'Yes'	4.17	3.29	3.80	2.45	3.63	3.19	3.73	3.21	32
'No'	3.16	2.70	3.57	3.58	2.98	3.20	2.36	2.61	11
Difference	1.01	0.59	0.23	−1.12	0.65	−0.01	1.36	0.60	

values indicate inconsequential collinearity, since no VIF value exceeded 10.0 [57].

5.3. Estimation of the discriminant function

To derive the discriminant function one must decide on the method of estimation and then determine the number of functions to be retained. The predictive accuracy is assessed by the number of observations classified into the correct groups. Simultaneous and stepwise estimation techniques are used for such estimation. In this case the stepwise method is adopted as the objective of this analysis is to determine which variables are the most efficient in discriminating between "intention to adopt ISO1400" and "no intention to adopt ISO14000".

Stepwise estimation involves entering the independent variables into the discriminant function one at a time based on the basis of their discriminating power. The stepwise method is superior when the researcher wants to consider a relatively large number of independent variables for inclusion in the function. By sequentially selecting the next best discriminating variable at each step, variables that are not useful in discriminating between the groups are eliminated and a reduced set of variables is identified. As the present study has eight independent variable and the authors intend to identify a set of variables that are useful in discriminating between the groups, the stepwise method is adopted. A discriminant function was developed to understand the group differences.

The unweighted group means for each of the independent variables indicated that there was substantial difference between the mean ratings for the 'yes' and 'no' groups for H1, H4 and H7 (Table 6).

A stepwise procedure was then used. A minimum F value of 1.00 (default value) was used for entry. The results indicated that H1, H3, H4 and H7 entered the model and were significant discriminators (Table 7).

Table 7
Summary of two-group stepwise discriminant analysis results

Steps	Entered	Wilks' lambda value	Significance
1	H1	0.583	0.0000
2	H3	0.542	0.0000
3	H7	0.493	0.0000
4	H4	0.475	0.0000

The discriminant function was highly significant ($p < 0.001$), as measured by the Chi-square statistic, which included only the four independent variables indicated above (see Table 8). The standardized canonical discriminant function coefficient and other values are shown in Table 9.

5.4. Statistical significance

After the discriminant function has been computed, it is necessary to assess its level of significance. A number of different statistical criteria are available. The four most popular statistical significance tests for evaluating the discriminatory power of the discriminant functions(s) are Roy's gcr; Wilk's lambda, Hotelling's trace, and Pillai's criterion. Roy's greatest characteristic root (gcr) measures the differences on only the first canonical root (or discriminant function) among the independent variables. Although the criterion provides some advantage and power and specificity of the test but makes it less useful in certain situations where all dimensions should be considered. The other three measures assess all sources of difference among the groups [56]. Wilks' Lamda has been used in this study. The larger the between group dispersion, the smaller the value of Wilk's Lamda and the greater the implied significance. The common criterion of 0.05 or beyond significance level was used. The Wilk's lambda values of all the four variables in the

Table 8
Canonical discriminant functions

Function	Eigenvalue	% of variance	Cumulative %	Canonical correlation	Wilks' lambda	Chi-square	Significance
1[a]	1.103	100.00	100.00	0.724	0.475	28.999	0.000

[a]Indicates the first canonical discriminant function used in the analysis. 1 = Intention to adopt, 0 = no intention to adopt.

Table 9
Standardized canonical discriminant function coefficients

Independent variables	Discriminant function coefficients
H1	0.716
H3	−0.543
H4	−0.290
H7	0.492

Table 10
Loading obtained from 'Yes' function

Hypothesis	Loading[b]
H1	0.804
H7	0.728
H4	−0.567
H2[a]	0.486
H8[a]	0.356
H5[a]	0.342
H3	0.181
H6[a]	0.132

[a]Factors which are not used in the analysis.
[b]Pooled within-groups correlation between discriminating variables and standardized canonical discriminant functions.

model are highly significant ($p < 0.001$, see Table 7). The level of significance of the first canonical function is also highly significant ($p < 0.001$).

5.5. Evaluating group differences

One means of assessing overall model fit is to determine the magnitude of differences between the members of each group in terms of the discriminant Z scores. A summary measure of the group differences is a comparison of the group centroids, the average discriminant Z score for all group members. If the overlap in the distribution is small, the discriminant function separates the groups well. The group centroid for the organizations that said 'yes' and 'no' to the adoption of ISO 14001 was 0.601 and −1.749, respectively which indicates small overlap and as such it is concluded that the discriminant functions separates the groups well. The loading obtained for 'yes' (function 1) is shown in Table 10.

5.6. Cutting score determination

Before developing the classification matrices, the cutting score is to be determined. The cutting score is the criterion against which each individual's discriminant score is judged to determine which group the individual should be classified into. In constructing classification matrices it is necessary to determine the 'optimum cutting score' which will differ depending on whether the sizes of the groups are equal or unequal. Because the two groups were unequal in size in this case, a weighted average was used to account for the difference in variance [56, p. 265].

The cutting score = (number in group 1)*(centroid for Group 1) +(number in group 2)*(centroid for group 2) divided by ((number in group 1)+(number in group 2)) = 0.00

The procedure for classifying organizations would be

- Classify an organization as likely to adopt ISO 14001 as its environmental management standards if its discriminant score is positive.
- Classify an organization as not likely to adopt ISO 14001 as its environmental management standards if its discriminant score is negative.

Table 11
Classification results

Actual group	Sample size	Predicted group 'No'	Predicted group 'Yes'
'No'	11	8 (72.7%)	3 (27.3%)
'Yes'	32	1 (3.1%)	31 (96.9%)
90.7% of original grouped cases correctly classified			

5.7. Classification matrices

As the dependent variable is nonmetric, it is not possible to use a measure such as R^2, as is done in multiple regression, to assess predictive accuracy. Rather, each observation must be assessed as to whether it was correctly classified. Also, the statistical tests for assessing the significance of the discriminant function do not tell how well the function predicts. Therefore, to determine the predictive ability of a discriminant function, one must construct classification matrices. With multiple discriminant analysis, the *hit-ratio* (percentage correctly classified) is analogous to R^2 in regression analysis. The hit-ratio reveals how well the discriminant function classified the objects. Classification matrix for the observations were developed—about 91% of the original group cases were correctly classified (see Table 11).

5.8. Measuring predictive accuracy relative to chance

When the sample size of the groups are equal, the chance classification is obtained by dividing 1 by the number of groups. However the determination of chance classification for situations in which the group sizes are unequal is somewhat more involved. There are two ways of determining the chance classification. First, the 'maximum chance classification' and the second, 'proportional chance criterion C(pro)'. In the present study the second approach was used as this one is considered to be more appropriate [56, p. 269].

Table 12
Classification results using logistic regression

Actual group	Sample size	Predicted group 'No'	Predicted group 'Yes'
'No'	11	8 (72.73%)	3 (27.27%)
'Yes'	32	2 (6.25%)	30 (93.75%)
88.37% of original grouped cases correctly classified			

The a priori chance of classifying individuals correctly without the discriminant function, $C\ (\text{pro}) = p^{**}2 + (1-p)^{**}2$, where, p =proportion of organizations in group 1 and $1-p$ is the proportion of organizations in group 2. Substituting the appropriate values, the proportional chance criterion was 0.619 [(i.e., $(32/43)^{**}2 + (11/43)^{**}2$)]. Clearly, the classification accuracy of 90.7% is substantially higher than the proportional chance criterion of 61.9% . Thus the classification accuracy for the analysis exceeds at a statistically significant level compared to the classification accuracy expected by chance.

When the dependent variables have only two groups, logistic regression may also be used instead of discriminant analysis. Therefore, to verify the accuracy of the above classification, logistic regression was used and a very similar result was obtained. About 88% of the original group cases were correctly classified (see Table 12).

5.9. Interpretation of the discriminant function

As the discriminant function is statistically significant and the classification accuracy is acceptable, we should focus on making substantive interpretations of the findings. This process involves examining the discriminating functions to determine the relative importance of each independent variable in discriminating between the variables. Three methods are recommended: (1) standardized discriminant weights, (2) discriminant loading (structure correlation), and (3) partial F-values. In the present study, the third approach was adopted as 'Partial F-Values' method is considered to be more appropriate when stepwise discriminant analysis, as in this case, has been used [56, p. 272].

The discriminant function was used to determine the relative importance of each independent variable in discriminating between the groups. The independent variables were screened by the stepwise procedure, and H1, H3, H4 and H7 were significant enough to be included in the function. The independent variables were ranked in terms of their univarate F-ratio (Table 13).

Of the four variables (H1, H3, H4, H7) used in the function, H1 discriminates the most and H3 the least (see Table 13).

Table 13
Summary of interpretative measures for two-group discriminant analysis

Variable	Univarate F-ratio	Rank
H1	29.28	1
H2	11.93	4
H3	1.49	7
H4	14.57	3
H5	7.91	5
H6	0.001	8
H7	23.97	2
H8	6.97	6

Table 14
Summary of two-group stepwise discriminant analysis

Steps	Entered	Wilks' lambda value	Significance
1	H1	0.614	0.0000
2	H7	0.590	0.0000
3	H3	0.564	0.0000

Table 15
Classification results

Actual group	Number of cases	Predicted group 'No'	Predicted group 'Yes'
'No'	21	11 (52.4%)	10 (47.6%)
'Yes'	32	5 (15.6%)	27 (84.4%)
71.7% of original grouped cases correctly classified			

5.10. Combination of 'No' and 'Not Sure' responses

It was decided to run an analysis where the 'no' and 'not sure' responses were combined into 'no' responses to see whether a better hit ratio could be obtained. The results indicated that H1, H3 and H7 entered the model and were significant discriminators (Table 14).

The group centroids for the organizations that said 'yes' and 'no' to adoption was 0.681 and −1.090, respectively. The group centroids were closer together than the first case indicating that the discriminant function developed was not able to discriminate as well compared to the situation when 'not sure' cases were excluded from the analysis.

Table 15 presents the result of the analysis when the 'no' and 'not' sure responses were treated as 'no'. About 72% of original grouped cases were correctly classified which was lower than the 90.7% accuracy obtained earlier indicating that the combination of the 'no' and 'not sure' answers

Table 16
Classification results using logistic regression

Actual group	Sample size	Predicted group 'No'	Predicted group 'Yes'
'No'	20	13 (65.0%)	7 (35%)
'Yes'	32	5 (15.62%)	27 (84.38%)
75% of original grouped cases correctly classified			

would not enhance the outcome of the analysis. This is possible that the organizations, which are 'not sure', could also potentially be in the 'yes' group.

As in the earlier situation, to verify the accuracy of the above classification, Logistic Regression was used and a very similar result was obtained. Only 75% of original grouped cases were correctly classified (see Table 16).

6. Summary findings

This study has developed a predictive discriminant function to assess whether a company is likely to pursue ISO14001 certification and the associated motivational factors corresponding to the decision.

The predictive discriminant function can be expressed as the following model:

A company's decision to adopt IS014001
$= 0.716^{*}$ (mean value of the items under 'Top Management')
-0.543^{*} (mean value of the items under 'Employee Welfare')
-0.290^{*} (mean value of the items under 'Environmental Regulations)]
$+0.492^{*}$ (mean value of the items under 'Head Office's Environmental Practices')

The '*' represents discriminant function coefficients (see Table 9 for values).

Substituting the group mean of H1, H3, H4 and H7, calculated from the questionnaires, the predictive function will yield a positive or negative number. Since the cutting score has been determined to be zero, a positive number indicates a company's likelihood to adopt ISO14001 as its environmental management standard. A negative number indicates otherwise. The relative rankings of the 8 originally hypothesized discriminating variables, based on F-values is presented in Fig. 4.

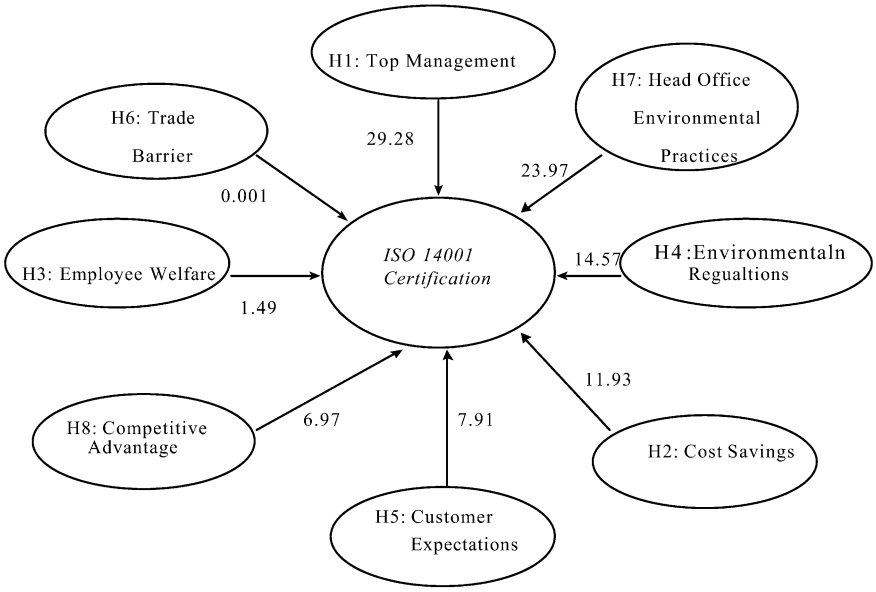

Fig. 4. Relative strengths of the factors indicating the intention to get ISO 14000 certified.

Of the top four motivating factors, three i.e., Top Management, Environmental Practices of the Head Office, and Environmental Regulations (see Fig. 4) are mainly push factors that are directive in nature. The adoption of ISO14001 will be less resistive if the fourth factor—cost saving, a pull factor (voluntarily in nature) is significant and well publicized.

7. Discussions, limitations and future directions for research

7.1. Sample size

One of the major concerns of this study is small sample size. Although the sample size met minimum overall sample size requirement of five observations per independent variable and the ratio of smallest group size and the number of independent variables i.e., the smallest group size must exceed the number of independent variables [56, p. 258], it is important to note that the results of discriminant analysis become unstable as the sample size decreases relative to the number of independent variables. However, it is to be recognized that at any given alpha level, increased sample size always produces greater power of the statistical test. But increasing sample size can also produce "too much" power. Therefore, the researcher must always be aware that sample size can impact the statistical test by either making it insensitive (at small sample size) or overly sensitive (at a very large sample size). Based upon results of number of two-group data simulations, Foley [58] found that when n/p (where, $n =$ the number of units in each of the two groups and $p =$ number of response variables) was greater that 3, the average internal hit-rate across applications was "reasonably close". As the present study did not have equal number of units in each of the groups, this guideline is not applicable. However, it is to be noted that the hit-rate obtained from the present study is very high (90.7%). Huberty [59] argues that validity is a matter of degree, the larger the sample size, the greater the validity estimation i.e., the larger the sample, the better the hit-rate assessment. He further points out that for the ratio of 'test sample' to 'design sample', only limited guidance has been given in terms of rule of thumb for minimum total sample size. Hair [56, p. 258] suggests that as a practical guide, each group should have at least 20 observations. In case of a large sample size, many times the sample is divided into two sub-samples, one used for estimation of the discriminant function (called analysis sample) and another for validation purposes (called holdout sample). No definite guidelines have been established for dividing the sample analysis and holdout groups [56, p. 258].

In view of the above discussion it is understandable that in case of the present study the small sample size, although it meets the minimum sample size requirement, runs the risk of being less sensitive to the statistical tests. With a larger sample size, the results of the analysis could also be validated with the holdout sample.

7.2. Criterion-related validity and outcome measures

Criterion related validity, sometimes called predictive validity or external validity, is concerned with the extent to which the measuring instrument is related to an independent measure of the relevant criterion. In their study on "An Instrument of Measuring the Critical Factors of Quality Management" Saraph et al. [47] used two measures of quality performance: (a) quality performance of the responding division of the company for the past three years and (b) customer satisfaction with quality for the past three years. These two ratings, which were collected on a 5-pont scale, were averaged to form a single measure. The criterion-related validity of the combined set of eight measures of quality management was measured by examining the multiple correlation coefficient computed for the eight measures and the computed outcome measure described above. This study used a similar procedure as that of Saraph et al. But only one outcome related measure was used to test the criterion-related validity of the constructs. Two issues need to be addressed here: (a) the measurement of the outcome variable(s) and (b) the statistical method available to assess the validity.

Regarding the measurement of the outcome variable, it is noted that Saraph et al. [47] used two subjective measures. The respondents were asked to indicate their subjective assessments on the two outcome measures based on *past three years*. Whereas, Ahire et al. [60] used six measures of product quality. In contrast to study of Saraph et al., the Ahire et al. study apparently did not ask the respondents to indicate the outcome for the 'past few years'. The present study also did not ask the respondents to provide the outcome related information for a specific number of past years. The measure that was used in this study was subjective in nature because of the difficulty in identifying and obtaining an objective measure that would be appropriate for the different types and sizes of businesses in the sample [47]. Yeo [5] in his study on "Identifying the Critical Factors of Environmental Management and Developing Their Performance Measures" used two outcome variables which were then averaged to form a single measure. The two measures used were (a) subjective assessment of the environmental performance of the company for the *past three years* and (b) an assessment of the stage of environmental development the company is in, based on the Environmental Development Model developed by Hunt and Auster [52]. The stages of environmental development are "beginner", "fire fighter", "concerned citizen", "pragmatist" and "proactivist". These authors have developed quotes that are characteristics of organizational practices at each development stage. Yeo [5] asked the respondents to mark the quotes that best described the practices of their company. It is felt that the two measures used in Yeo's study are appropriate but one could argue that it may not be appropriate to combine the two outcome

variables which are different in nature to develop the single outcome measure. This is because of the fact the nature of the first measure i.e., the assessment of the environmental performance of the company for the past three years is different from the nature of the information captured under the second measure i.e., assessment of the stage of environmental development the company is in. These two measures should be used separately to see whether similar results are obtained. Measures similar to those used by Yeo may be adopted in future studies of this nature.

Different authors have used different methods in assessing criterion-related validity. For example, Saraph et al. [47] and Yeo [5] have used multiple correlation. Ahire et al. [60] have used structural equation modeling to estimate the correlation between the various constructs. On the other hand Flynn et al. [36] have used canonical correlation approach. The authors argue that structural equation modeling takes into account measurement error by estimating measurement error variances from the data and model specification, whereas canonical correlation does not. Because of the nature of the outcome measure used in the present study, it was appropriate to use multiple correlation coefficient to assess the criterion-related validity.

7.3. Application of discriminant analysis in environmental management related issues

A review of the recent literature on the application of discriminant analysis indicate that this multivariate technique has not been applied in issues related to environmental management.

Ninety recently published articles related to discriminant analysis (1999-to date) were reviewed and found that this technique had been used in numerous areas like market segmentation [61,62], determination of shopping profile of house wives [63], human resource management [64], knowledge management [65], stock evaluation [66], real estate [67], strategic planning/management [68,69], entrepreneurship [70], information management [71], health care [72] and company performance evaluation [73]. As indicated above, it is interesting to note that there is no recent publication relating to environmental issues similar to the study presented here. In view of this it may be noted that the present study is filling a gap in the recent literature on the application of discriminant analysis in an emerging field.

7.4. Usefulness of the study in the context of Singapore and other countries

Predictive discriminant function developed in this paper can be used by both private and public agencies as a marketing tool to identify the potential customers. For example, The Singapore Productivity and Standards Board (PSB), the leading government-linked organization in Singapore, which is promoting the standards, can use the result of the study to further promote the certification of ISO 14001 among Singapore companies. For example, PSB may want to consider partnering with the Ministry of Environment in establishing policies based on the four significant discriminating factors identified from the study. Such policies may be targeted towards MNCs, which in turn may influence their local suppliers in adopting ISO 14001 as a recognized self regulated environment management standards. These policies could include incentives such as lower license or refuge fees; forms of tax incentives for certified companies who are willing to share their experiences with the policy-making bodies and the like.

The Singapore government provides substantial incentives to the companies to go for the ISO 14000 certification. For example, as was in the case of ISO 9000 certification, up to 70% of the cost of certification including the cost of external consultancy services are subsidized for ISO 14000 certification. It is therefore, important for the government to know the intentions of the companies and formulate the marketing strategies accordingly. For example, if it is found that there are lack of understanding and/or initiatives on the part of the target companies, the PSB and or other related organizations can design intervention programs for such organizations.

It may be assumed that many developing countries are eager to export their products to industrialized nations including the European Union member countries. The governments of such countries may find this study useful in identifying the target companies for designing and implementing intervention programs. Similarly, consulting firms may also find the study useful in targeting the potential clients.

7.5. Direction for further studies

Factors influencing the intention to adopt ISO 14001 were identified primarily based on the review of global literature on environmental management and quality management. Hence, it is expected that the findings reported here are also applicable across countries. However, the study has some weaknesses specially in two areas: (1) sample size and (2) the measurement of the outcome variables used for criterion related validity test. Therefore, it is recommended that further studies be conducted with larger sample size (i.e., a ratio of at least 20 observations for each predictor variable to test the accuracy of the predictive discriminant function developed in this paper. It is also suggested that replicative studies be conducted in different countries and in different industries with large sample size to confirm the validity of the model reported here.

Appendix A. Survey Questionnaire

A Survey on Motivation for ISO 14000 Certification

SECTION 1: Background Information of Your Company

1. Name of the firm : ————————
2. Annual sales : ———————— (optional)
   (Average of past three years)
3. Number of full time employees : ———————— (optional)
4. Type of industry
   (Please cheek one that most closely identify the industry in which your organization operates)
   ——— Chemical Industry
   ——— Electronics Industry
   ——— Others (please specify
5. Ownership please cheek one

Local	Foreign
——— MNC/Local Enterprise	——— MNC
——— SME (Net Asset $<$ S$8 million)	

6. Are you ISO 9000 certified? ——— Yes ——— No
7. Are you aware of ISO 14000? ——— Yes ——— No
   If yes, please proceed to SECTION 2
   If no, we thank you for your participation in this survey. Please return this survey form.

SECTION 2

Part A

1. Is your company ISO 14000 certified? ——— Yes ——— No
2. Does your company intend to apply for ISO 14000 certification? ——— Yes ——— No ——— Not Applicable
3. Does your company have an Environmental Management System? ——— Yes ——— No

Part B

Please rate the following statements with regard to ISO 14000 Environmental Management System.
For each of the statements, please indicate the degree of extent of practice in your organisation by circling the appropriate number shown on the right hand column. A five-point interval scale is used as follows:
$1 = Strongly\ Disagree\ (SD),\ 2 = Disagree\ (D),\ 3 = Undecided\ (U),\ 4 = Agree\ (A),\ 5 = Strongly\ Agree\ (SA)$

	SD	D	U	A	SA
1. Caring for the environment is an important consideration for our organisation.	1	2	3	4	5
2. Return on investments on environmental programs can be measured accurately in our organisation.	1	2	3	4	5
3. Environmental trade barrier is the only way to encourage our organisation to adopt ISO 14000.	1	2	3	4	5
4. Our Head Office (HO) is involved in ISO 14000 planning activities in our company.	1	2	3	4	5

5. ISO 14000 will help our company clinch positioning advantage in customers' minds over its competitors.	1	2	3	4	5
6. Our top management shows their concern for the environment via their actions.	1	2	3	4	5
7. There is a strong Environmental Division/Section within our organisation to promote ISO 14000.	1	2	3	4	5
8. ISO 14000 is a good Environmental Management System to assist our top management to cultivate environmental awareness within our organisation.	1	2	3	4	5
9. Our HO may adopt ISO 14000 as its Environmental Management System standard.	1	2	3	4	5
10. Environmental programs contribute to our organisation's bottom-line.	1	2	3	4	5
11. Benefits from ISO 14000 outweigh cost needed to implement the program in our organisation.	1	2	3	4	5
12. Our organisation has already reaped monetary benefits from its environmental programmes.	1	2	3	4	5
13. Our organisation will adopt ISO 14000 only if required by the environmental regulations.	1	2	3	4	5
14. There are programmes supported by our top management to drive home the message that environmental protection is important.	1	2	3	4	5
15. Employees will join an organisation that has a good Environmental Management programme.	1	2	3	4	5
16. Our organisation shows great concern in improving Employee Welfare in the area of Environment Health and Safety.	1	2	3	4	5
17. Implementation of ISO 14000 helps to ensure good employee welfare in the area of environmental health.	1	2	3	4	5
18. Our employees support Environmental programmes as it is linked to their welfare.	1	2	3	4	5
19. Our HO environmental goals and policies are understood or applied within our organisation.	1	2	3	4	5
20. Environmental protection legislation is the only way to encourage our organisation to adopt ISO 14000.	1	2	3	4	5
21. The government strongly encourages our company to adopt ISO 14000.	1	2	3	4	5
22. ISO 14000 will be widely adopted by our industry even though there is no government regulation/policy encouraging it.	1	2	3	4	5
23. Our organisation will adopt ISO 14000 if required by our customers.	1	2	3	4	5
24. Adopting ISO 14000 will make significant impact to our organisation's comparative advantage with regards to customer satisfaction.	1	2	3	4	5
25. Our customers are increasingly aware of the need to protect the environment via adopting ISO 14000.	1	2	3	4	5
26. Our products are environmentally of concern to the consumer or public.	1	2	3	4	5
27. Our organisation is benchmarking against our competitors with regards to ISO 14000.					
28. Our organisation is concerned about Environmental trade barriers.	1	2	3	4	5
29. There is increasing sign that environmental issues will become a trade barrier to our organisation in the future.	1	2	3	4	5
30. Policy makers of the home country may pass a law to make ISO 14000 organisations preferred corporate citizens.	1	2	3	4	5
31. It is foreseeable that ISO 14000 will become a minimum EMS standard for our company to do business with its partners in the trade block.	1	2	3	4	5

32. Our competitors may gain competitive advantages if they are ISO 14000 certified.	1	2	3	4	5
33. There is a target set by our HO to implement ISO 14000 in our organisation.	1	2	3	4	5
34. Our organisation will apply for ISO 14000 certification if our competitors have done so or have the intention to do so,	1	2	3	4	5
35. Our HO is heavily involved in implementing ISO 14000.	1	2	3	4	5
36. Operation costs will increase if ISO 14000 is adopted by our organisation.	1	2	3	4	5
37. There is competitive pressure in our industry to adopt ISO 14000.	1	2	3	4	5

THANK YOU FOR YOUR PARTICIPATION

THE END

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