CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

During the Earth Summit in Rio in 1992, the Business Council for Sustainable Development emphasised the need for business and industry to develop comprehensive tools to help measure environmental performance and develop powerful environmental management techniques. International Organisation for Standardisation or ISO was specifically requested to step up its activities in the environmental field in response to such needs (Marcus & Willig, 1997). Four years later, the International Organisation for Standardisation released a series of documents called ISO 14000 with the aim of providing guidance on what constitutes an acceptable Environmental Management System (EMS) for an organisation.

The ISO 14000 series is a set of voluntary standards and guidelines. The series does not set environmental performance values, but provide a basic structure that an organisation should use to meet its obligations (Lamprecht, 1997). The standard, therefore, is a procedural standard, not a performance standard. It avoids prescribing environmental strategies that should be implemented, but instead organises the tasks that are necessary for effective management (Pringle *et al.*, 1998). The series of documents that encompass ISO 14000 includes components such as environmental management systems, environmental auditing, environmental labelling, environmental performance evaluation, design for environment and product life cycle assessment.

Organisations worldwide in both public and private sectors are beginning to embrace the ISO 14000 guidelines, specifically the certifiable ISO 14001 standard for Environmental Management Systems. According to Edwards *et al.* (1999), firms are interested in pursuing ISO 14001 for a variety of environmental, organisational, and financial reasons, including:

- Improved compliance and environmental performance;
- Increased access to new and international markets;
- Reduced regulatory compliance costs, environmental liabilities, and insurance costs;
- Improved industry-government relations; and
- Enhanced public image and competitive advantage

While the above are powerful incentives for implementing an ISO 14001, there remains a high degree of uncertainty and ambiguity associated with the standard.

According to a U.S. Environmental Protection Agency (EPA) funded project on ISO 14001, there are two major sources of uncertainty surrounding the implementation of an ISO 14001. Firstly, the project questioned the ability of the ISO 14001 standard to help companies achieve their environmental goals. While the participating companies realised several short-term benefits, including improved environmental awareness, co-operation among employees, and enhanced regulatory compliance, they remained uncertain about the realisation of long-term goals, such as reduced environmental management costs and increased access to international markets (Edwards *et al.*, 1999).

Secondly, the project commented that companies are still learning to translate environmental objectives into operational processes. They feel the lack of explanation or instruction in ISO 14001 standard with respect to implementing environmental goals has hindered firms in adopting many of the ISO 14000 standards. The project

identified that ISO 14001 certified companies have expressed the need for (Edwards *et al.*, 1999):

- Guidance on identification and assessment of environmental aspects and impacts;
- Clarification on certain passages of the standard, including the EMS auditing process;
- Management tools for conducting EMS self-assessment; and
- ISO 14001 implementation case studies.

2.2 ISO 14000 Series: ISO 14001 and ISO 14004

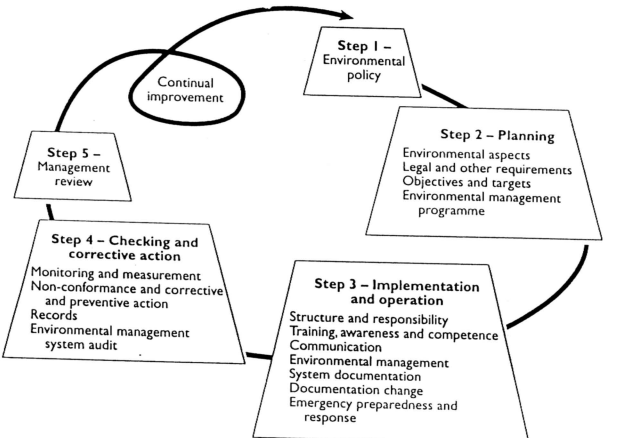
The ISO 14001 standard, which lays out requirements for establishing an EMS, is the centrepiece of the series. ISO 14001 is the normative environmental management system standard, which specifies requirements that must be met for certification. ISO 14004, on the other hand, is an informative standard providing guidance related to how to implement ISO 14001 (Harrington & Knight, 1999). Implementing an EMS that conforms to the ISO 14001 standard may help businesses integrate environmental values into their operations. The EMS is designed to continually improve system and environmental performance. The basic format and principles that underlie ISO 14001 and ISO 14004 can easily be pictured as shown in Figure 2.1. This is based on Plan-Do-Check-Act management model. The elements of ISO 14001 are briefly described in Table 2.1.

The ISO 14001 embraces five principles., that is:

(i) Principle 1 – commitment and policy

This principle enables the company to develop a statement of its commitment to the environment that will form the basics of its plan of action.

Figure 2.1: The five steps and elements of ISO 14001.



Source: Welford, 1998

Table 2.1: Elements of ISO 14001

Element	Brief details
Principle 1- Commitment and Policy	
Environmental policy	• Develop a statement of your organisation's commitment to the environment. Use this policy as framework for planning and action.
Principle 2- Planning	
Environmental aspects	• Identify environmental attributes of your products, activities and services. Determine those that could have significant impacts on the environment.
Legal and other requirements	• Identify and ensure access to relevant laws and regulations (and other requirements to which your organisation adheres).
Objectives and targets	• Establish environmental goals for your organisation, in line with your policy, environmental impacts, views of interested parties and other factors.
Environmental management programme(s)	• Plan actions to achieve objectives and targets.
Principle 3- Implementation and Operation	
Structure and responsibility	• Establish roles and responsibilities and provide resources.
Training, awareness and competence	• Ensure that your employees are trained and capable of carrying out their environmental responsibilities.
Communication	• Establish processes for internal and external communications on environmental management issues.
Environmental management system documentation	• Maintain information on your EMS and related documents.
Document control	• Ensure effective management of procedures and other system documents.

.....continuation of Table 2.1: Elements of ISO 14001

Operational control	• Identify, plan and manage your operations and activities in line with your policy, objectives and targets.
Emergency preparedness and response	• Identify potential emergencies and develop procedures for preventing and responding to them.
Principle 4- Checking and Corrective Action	
Monitoring measurement	• Monitor key activities and track performance.
Non-conformance and corrective and preventive action	• Identify and correct problems and prevent recurrences.
Records	• Keep adequate records of EMS performance.
Environmental management system audit	• Periodically verify that your EMS is operating as intended.
Principle 5- Review and Improvement	
Management review	• Periodically review your EMS with an eye to continual improvement.

Source: Hussein Rahmat, 1999.

(ii) Principle 2 – planning

The planning stage enables the company to identify and determine significant impacts on the environment and plan a programme that will help to achieve its objectives and targets.

(iii) Principle 3 – implementation and operation

The third principle is implementing an environmental management plan that will provide direction and consistent performance.

(iv) Principle 4 – checking and corrective action

The fourth principle is made up of an internal and external auditing system that is designed to highlight discrepancies in the EMS and establish corrective action to overcome these discrepancies.

(v) Principle 5 - review and improvement

The fifth principle is reinforcement of management's commitment to the EMS by conducting personal reviews of the system to ensure that it is meeting its goals and continuously striving to get better. At the very top is total commitment by the organisation to lessen its negative impact on the environment and not to limit itself to enforcing governmental regulations but to exceed them, to self-regulate and striving to continuously improve, even when it is not forced to improve by internal sources (Harrington & Knight, 1999).

On the whole, though the ISO standard is useful as an EMS framework, meeting ISO 14001's minimum requirements will not necessarily improve a company's environmental performance. It is the commitment of an organization and its employees, driven by environmental regulations and pressure from stakeholders, which determines the extent to which an organization will achieve leading-edge environmental management.

2.3 Why is ISO 14001 EMS important?

Improved compliance with laws and regulations

ISO14001 requires an organisation to establish and maintain a procedure for identifying and providing access to legal requirements applicable to its activities,

products, or services. This requirement will compensate, to a considerable extent, for the ignorance that prevails in places where such laws are not enforced (Cascio *et al.*, 1996; Woodside *et al.*, 1998).

Improved environmental performance

The existence of an EMS in a company will usually lead to environmental performance improvement and reduction in environmental impact. The nature of an organisation dictates that when an issue is brought into its management structure, it tries to deal with it systematically and positively. When objectives and targets are set within the management system and people and the organisation as a whole are evaluated on whether they meet these objectives and targets, improvements will follow (Harrington & Knight, 1999).

Liability and risk reduction

Incidents are expensive. An effective EMS, such as ISO 14001, provides a way to systematically identify and manage environmental risk and liability. This can be a significant contribution to a due diligence analysis in the event of an incident (Harrington & Knight, 1999).

Reduced cost / increased revenues

A properly designed EMS allows efficient identification of opportunities for cost saving – in other words, it can trigger procedural and/or technological changes that reduce the total cost of a product or improve its value. Such improvements allow companies to use a range of inputs more productively – from raw materials, to energy, to labour thus offsetting the costs of reducing environmental impact. Indeed, it can often trigger an outbreak of 'common sense' thinking, where sometimes very obvious and easy solutions to environmental problems are discovered (Goodman & DNV, 1998). As Japan and Germany have shown, increased efficiency increases competitiveness,

lowers production costs, reduces materials costs and increases revenues and profitability (Harrington & Knight, 1999).

Customer assurance

Businesses are becoming increasingly concerned about environmental management – they will not want to risk reputations or inherit liabilities as a result of poor environmental performance by their suppliers (Ahmad Nazmi, 1997). The needs or concerns of ownership/ management, customers, suppliers, regulatory agencies, the community, and insurance companies regarding the organization's environmental practices may be satisfied having an EMS in place (NADCA, 2001).

Satisfy stakeholder interest

Companies are increasing concerned with satisfying the expectations of a broad range of stakeholders, including investors, the public, and environmental groups. ISO 14001 registration can satisfy the public's need for corporate accountability. Companies with ISO 14001 EMS certification can provide confidence to their stakeholder that they are complying with regulations and continually improving their EMS. ISO 14001 certification can demonstrate an organisation's commitment and credibility regarding environmental issues. It demonstrates compliance not only with existing regulations but also with a publicly declared policy such as the ICC Charter (Tibor & Feldman, 1996).

Improved public image

A company that has been recognised for its EMS and for its environmental performance will be seen much more positively by the media than other organisations. Organisations can no longer engage in 'greenwash' – treating the environment as a public relations issue rather than a performance issue. They must be able to

substantiate their claims; they cannot give empty promises and platitudes without any substance to back them up (Harrington & Knight, 1999).

Increases industrial efficiencies

Environmental management systems primarily address the inefficiency of industrial operations that are related to the use of materials, substances, energy, water, and land. Environmental protection is not only about protecting human and ecological health – important as these are – but also about competitiveness, profitability, and sustainability, which are greatly improved by minimising waste and the misuse of resources. Here too, through environmental management systems, industry can instil employee attitudes to avoid such waste and misuse as part of an ethic that promotes both respects for the natural world and for the welfare of the enterprise (Woodside *et al.*, 1998).

Effect on the banking industry

The application of ISO 14001 to qualify prospective recipients of bank loans and aid for development projects has not yet been thoroughly explored. International financial institutions –such as the World Bank, the Overseas Private Investment Corporation, the United States Agency for International Development – as well as private-sector commercial lenders and equity investors may eventually require ISO 14001 commitments from borrowers. Since ISO 14001 can be a credible indicator of an organisation's efforts to meet its environmental responsibilities, it seems reasonable that registrations to the standard could be used to 'screen' prospective borrowers and recipients (Cascio *et al.*, 1996).

2.4 Identifying environmental aspects and impacts

The ISO 14001 EMS is a system where each element is related to and integrated with another. An important consideration when implementing ISO 14001 is the relationship among environmental aspects, environmental impacts and the EMS. An aspect is an interaction with the environment, and an impact is the result of this interaction (Harrington & Knight, 1999).

A register of environmental aspects and impacts is therefore, necessary, to identify all the environmental aspects and the associated existing and potential impacts which may be associated with the organisation's activities or operations, and which should be eliminated, managed or controlled. However, the standard is not intended to require a detailed life cycle assessment (MS ISO 14001, 1997).

2.4.1 Environmental aspects

Improved environmental performance lies in an organisation's ability to manage the elements of its operations, which may have an impact to the environment. However, these elements or environmental aspects must be identified before they can be managed. As defined in the ISO 14001, environmental aspects include all elements of an organisation's activities, products, and services that can have an impact on or interact with the environment (MS ISO 14001, 1997).

The identification of the environmental aspects is an ongoing process that determines the past, current and potential impact (positive or negative) of an organisation's activities on the environment. This process also includes the identification of the potential regulatory, legal and business exposure affecting the

organisation. It can also include identification of health and safety impacts, and environmental risk assessment (MS ISO14004, 1997). Because no two organisations are alike, the aspects they will manage will not be alike, neither will the methods employed to undertake that management be similar (Sheldon & Yoxon, 1999).

Aspects are commonly categorised according to inputs and outputs, both controlled and uncontrolled, beneficial or adverse. For example, here are some typical aspects (Harrington & Knight, 1999):

- Raw material use
- Energy use
- Emissions to air
- Discharges to water
- Alterations to land
- Solid waste
- Hazardous waste
- Noise
- Odour

One of the benefits of examining aspects associated with different processes is that employees can begin to view their job and the organisation in a broader environmental context to see whether they can identify opportunities to minimise impact.

2.4.2 Environmental impacts

Once the aspects are identified, the environmental impact associated with each aspect can be listed and evaluated. The cataloguing of impacts should not be limited to

current impacts, but should consider the potential for past and future impacts. Impacts can be such phenomena as ozone depletion, acid rain, reduction of biodiversity, and negative effects on human or ecosystem health (Harrington & Knight, 1999).

Information resources that can be used to evaluate impacts include monitoring data, regulatory requirements, risk assessments, audits and previously collected data from unplanned releases. The level of analysis will depend on the facility and the type of impacts. In some cases, a full-fledged risk assessment may be needed to evaluate and prioritise the impacts. In others, the evaluation might be limited to identifying the potential for health or safety impacts, ecosystem impacts, or non-compliance with regulations (Ritchie & Hayes, 1998).

In establishing a register of environmental aspects and impacts the organisation should consider (MS ISO 14001, 1997):

- Past, present and future activities and /or operations;
- Normal, abnormal (start up/ shut down/ periodic maintenance) and upset or incident /accident conditions; and
- Upstream, internal and downstream aspects and impacts (such as those associated with raw material acquisition and resource use, transport activities, processes, and the use of the finished products).

2.4.3 Determining the significant impacts

Once all impacts have been identified, the most difficult part of the process begins: determining which impacts are significant for the business. A significant environmental aspect is an environmental aspect that has or can have a significant environmental impact (MS ISO 14001, 1997).

The term "significance" is not defined in either ISO 14001 or ISO 14004. The definition of "significant" vary from one organization to another, depending on the relative severity and quantity of environmental impacts associated with the business as well as the degree of control the business has over those impacts. An organization has to define significance for itself and be able to defend that definition, or its process for attributing significance. These decisions will seldom be simple or obvious. Hence, an organisation must study each environmental impact and determine which are potentially the most significant. This selection is the main input for the rest of the planning and implementation activities and will determine the effectiveness of an EMS implementation (Anon, undated).

In an ISO 14001, the significant environmental aspects and impacts identified are:

- Considered in setting objectives and targets;
- Consulted in establishing operational controls; and
- Used to determine which items should be monitored and measured to track performance and to ensure correct operation of relevant operational controls and conformance with objectives and targets.

As stated by Johnston *et al.* (2000), the correct identification and assessment of significant environmental impacts will enable an organisation to:

- Establish what company environmental performance is;
- Establish where effort should be spent to improve environmental performance;
- Avoid the attention of regulators;
- Increase company efficiency; and
- Effectively and safely include the environment in a marketing strategy.

For each identified environmental impact, a number of factors can be considered to form the judgement on its significance (Sheldon & Yoxon, 1999). The ISO 14001 standard does not prescribe a method for determining the significance of an environmental impact. It is left to the organisation to develop the criteria and procedures by which it determines significance. The reason that the ISO standard does not set specific performance requirements in an auditable standard is that ISO must respect the right to national sovereignty enshrined in the WTO (World Trade Organisation) agreements (Harrington & Knight, 1999). Judgment of significance can be subjective, especially if there is no legal or other tangible requirement. Thus, the challenge here is to establish significant criteria and develop a process for evaluating and prioritising the aspects against those criteria.

This assessment of significance can be qualitative or quantitative. The MS ISO 14004 guidance does provide a few criteria to take into considerations when assessing significance, both environmental and business concerns. MS ISO 14004 (1997) outlines a simple, risk-based methodology and suggests that at least the following be considered in the determination of significance. The environmental concerns include the following:

- The scale of the impact;
- The severity of the impact;
- Probability of occurrence;
- Duration of impact.

The business concerns include the following:

- Potential regulatory and legal exposure;
- Difficulty of changing the impact;
- Effect of change on other activities and process;
- Concerns of interested parties;
- Effect on the public image of the organisation.

A generic list of significance criteria may include the following:

- Regulatory requirements;
- Demonstrable environmental impacts;
- Frequency of occurrence;
- Financial implication; and
- Stakeholder concerns.

Once the significance criteria have been established, the organisation must consider what method will be used to evaluate the identified aspects against the criteria. A common pitfall in implementing this requirement is to make the evaluation of the significant environmental aspects too complex. It is very easy to get caught up in the details and over-analyse. The two most important features of any significance evaluation process are:

- The method must be objective (i.e., decisions about significance must be based on sound professional judgement rather than organisational biases); and
- The method must facilitate the prioritisation of the environmental aspects (i.e., the method must identify those aspects that have the greatest impact on the environment).

2.5 ISO 14000: the world-wide response

Recent developments in the ISO 14000 series of standards have provided new opportunities and challenges to both government and industry worldwide. The overall response around the world to the ISO 14000 series of standards appears to be generally positive. There is, however, a range of reactions based on the degree of awareness of the ISO 14000 series of standards and the process for their

development. The prime motivation for seeking compliance varies with the implementers.

2.5.1 The European reaction

Halfway around the globe, European nations are divided in their attitude toward ISO 14000. Although there is not a problem with the ISO 14000 standards per se, there is some concern regarding the applicability of ISO 14000 in the context of the Eco-Management and Audit Scheme (EMAS), which is a European Union regulation that became effective in July 1993. Germany and the United Kingdom, among others, are cautious about how the two standards will be integrated. Some feel that EMAS is more comprehensive than ISO 14000, and that ISO 14000 could undermine EMAS's objectives. In spite of these concerns, the German government and industry regard ISO 14000 as a useful tool to protect the environment and manage environmental issues. Both the government and industry, however, are concerned that accreditation procedures be equal for certification entities and that there be harmonisation on an international level (Bridgen, 1997).

Some European nations are embracing ISO 14000 despite the existence of the EMAS. In the Netherlands, for example, influential members of the government have declared that publication of ISO 14000 is "an important milestone". The Dutch government anticipates that ISO 14000 will provide the basis for an important industry and government partnership to lead the nation and the world towards sustainability. The government is considering providing benefits, such as streamlined licensing process, for companies with ISO 14000 certification. Industries in Netherlands are equally positive about ISO 14000, and even prefer it to the EMAS and the British

Standard, BS 7750. The industries would like to see the relationship between ISO 14000 and EMAS clarified, and would like to see ISO 14000 accepted as a major part of the EMAS requirements (Bridgen, 1997).

The story in Norway is similar to that in the Netherlands. Both industry and government are supportive of ISO 14000. The level of readiness in Norway may partly be the result of the fact that Norway already has laws that require internal company controls for compliance with existing laws and regulations dealing with environmental protection and worker exposures. Despite the general acceptance of ISO 14000 by the industry in Norway, some smaller companies with only European markets may opt to comply with EMAS, as it is perceived as being less expensive to implement. In addition, some harbour concerns that ISO14000 will become a paper chase rather than an effective tool to achieve sustainability. These concerns, however, are balanced by practical realities. Norway is a relatively small country, and the relationship between industry and the community is close, as a result, in such tight quarters, it becomes more difficult for Norwegian industry to become certified under ISO 14000 without also implementing the standards in good faith (Bridgen, 1997).

2.5.2 South American responses

In South America, awareness of ISO 14000 has increased significantly of late. Brazil has been involved in the ISO 14000 process, as evidenced by the hosting of the ISO 14000 meeting in Rio de Janeiro in June 1996 and the support from the Ministry of the Environment. The Brazilian government recognises that the standards will help to improve the relationship between environmental regulations and economic activities, and expects benefits from the proactive approach of ISO 14000.

Large companies in Brazil can see a competitive advantage from certification. Thirty-three companies and a number of other entities have formed the Environmental Standardisation Supporting Group (GANA). Industry expects that certification will assist in increasing global market share, improve access to credit with a low interest rate, improve government and public relations, present a positive environmental image, and provide a rationalisation of environmental costs. There is, however, some concern regarding the costs of implementation and the potential for the ISO 14000 standards to be formulated in such a way as to be aware of the potential importance of ISO 14000 and have had only limited involvement in the process prior to the meeting in Rio (Bridgen, 1997).

2.5.3 Japanese responses

The Japanese government supports the ISO 14000 process; the Ministry of Trade and Industry (MITI), in particular, is very proactive in incorporating ISO 14000 as part of the Japanese industrial standards and establishing a scheme of assessment and registration, even though it is concerned about how to measure the effectiveness of EMS (Bridgen, 1997).

For Japanese firms, the driving forces for certification are the perceived additional competitive advantages associated with environmentally responsible business, and the increased access to new markets. The most prominent supporter of ISO 14001 in Japan is the electronics industry, followed by the machinery manufacturing industry. Japanese companies have watched the development of the ISO 14000 series closely, and are increasingly interested in ensuring that Japan's national standards are compatible with internationally adopted standards. Japan established the Environmental Management Standardisation Study Committee in May

1992, as the Japanese representation to TC 207. The Committee resides within the Japanese Industrial Standards Committee (JISC), and is now taking steps to adapt the Japan Industrial Standards (JIS) to comply with the ISO 14000 series. Also, local governments are studying how to replace their current "command and control" approach to environmental regulation with ISO 14000 principles (Edwards *et al.*, 1999).

The Japan Accreditation Board for Conformity Assessment (JAB) is responsible for authorising Japanese registrars for ISO 14001 as well as other standards. The JAB is also responsible for authorising and overseeing the organisations that train and certify environmental auditors (Edwards *et al.*, 1999).

2.5.4 Korean responses

Korea is another Asia country at the forefront with regard to ISO 14000. The Korean government passed a law titled "Act of the Transformation to Environmentally Friendly Enterprise" which took effect in July 1996. The purpose of the act is to encourage industry to implement the ISO 14000 series. The government believes that implementation of ISO 14000 could provide Korean industry with a competitive edge in worldwide markets, as well as translate to environmental benefits, such as pollution prevention and EMS. As the result, the Ministry of Trade and Industry has taken an active role to foster implementation of ISO 14000 and is in charge of ISO 14000 certification in the country.

Although the Korean government is embracing the ISO 14000 approach, industry, with cost concerns in mind has been a reluctant suitor. Korean industry is enticed by the potential benefits of ISO 14000, but also sobered by the possible consequences of failure to adopt ISO 14000. Industry is concerned that failure to

adopt ISO 14000 will effectively shut it out of the worldwide marketplace. Despite the general enthusiasm for ISO 14000, concerns still remain that ISO 14000 focuses too much on paper, with no emphasis on objective measures to ensure that the paper translates to real environmental gains (Bridgen, 1997).

2.5.5 Taiwanese responses

Taiwan has shown considerable support of sustainable business practices. The China Productivity Centre currently provides government-subsidised management consulting to Taiwan industry and is assisting industries in implementing ISO 14001. The Taiwan Environmental Protection Agency promotes the "Green Mark" (eco-labelling) system, and the Bureau of Foreign Trade collects information to track ISO 14001 implementation. In addition, the Ministry of Economic Affairs (MOEA), the central agency for economic and industrial planning and program implementation within Taiwan, supports an inter-ministerial committee to study ISO 14000 and its incorporation into Taiwan's existing national standards system, the China National Standards (Edwards *et al.*, 1999).

2.5.6 Malaysian responses

Our involvement in ISO 14000 began in 1993 when Malaysia was represented by SIRIM at the first ISO/TC207 plenary session in Canada (Abdul Aziz Long, 1998). In line with our government's aspiration for balanced and sustainable development in Malaysia, more organisations and companies have shown keen interest in the implementation of the Environmental Management Systems (EMS). Based on the survey carried out by an independent German source, Malaysia has been ranked 21st

among the top 26 countries that are environmentally conscious. The survey used the numbers of reported companies that have been certified with ISO 14000 certification (ISC Z, 2000).

The total number of organisations that obtained ISO certification has reached 241 in December 2000 (ISC Z, 2000), with Selangor, Penang, Johor and Malacca as the main contributors. These numbers are still far less than that compared to countries like Japan, Germany, the United Kingdom and the US. There is little experience in implementing the ISO 14001 EMS standard in Malaysia. However, the standardisation, though still new, has proved to benefit more in enhancing competitiveness edge as to promote a better, systematic management structure in resource handling and long-term cost saving. Most of the organisations that are certified are multinational organisations and leading electronic industries.

Overall, since the publication of ISO 14001 in September 1996, the number of organisations certified with ISO 14001 has been increasing. Table 2.2 shows the number of certificates issued in Asian countries (Kun, 1999). ISO 14001 is gaining wider acceptance globally and is becoming a norm in environmental management in the near future.

2.6 Industries and business organisations responses

Companies are beginning to realise that environmental issues need to be addressed for a number of reasons, including, consumer pressure, potential cost savings, legislation and ethics. Inadequate management systems have been the cause of environmental damage and have cost firms and organisations heavily in terms of clean-up costs and damaged reputations. At the extreme we can think of disasters such as

Table 2.2: Number of certificates issued in Asian countries (as of June, 1998).

Country	Number of certificates
China	32
Hong Kong	16
India	60
Indonesia	26
Japan	1000 (6,648 in June 2001)
Korea	247
Malaysia	46 (241 in December 2000)
Philippines	10
Singapore	50
Thailand	57
World total	4400

Source: Kun, 1999; Peglau, 2001

Exxon Valdex oil spill and the Union Carbide explosion at Bhopal, where the environment became irreparably damaged in its turn due, at least in part, to inadequacies in systems which were supposed to prevent such disasters (Welford, 1999).

For the Japanese electronics manufacturer Canon, environmental responsibility is an integral part of management. They have established stringent organisational environmental objectives that have resulted in the elimination of hazardous chemicals from the manufacturing process, energy conservation through the extensive use of solar energy, new lines of environmentally friendly products and a recycling network to collect and reuse spent cartridges since 1990 (Starik *et al.*, 1996).

The German diamond-processing equipment manufacturer, Ernst Winter & Sohn, has designed and implemented a total integrated environmental management system, which not only attempts to 'green' business through environmentally sensitive

facility placement and equipment selection, but also through transferring this orientation to its employees via company-sponsored home environmental audits (Starik *et al.* 1996). Table 2.3 below shows a few examples of organisations that have benefited from implementation of ISO 14001.

Table 2.3: Examples of organisations that benefited from implementation of ISO 14001

Organisations	**Results of implementation of ISO 14001**
3M Corporation	• Reduced chemical waste, organic waste, particulate air waste, discharged water waste and trash by 35% since. Saved $156 million by reclaiming and selling manufacturing waste.
Baxter International Inc.	• 42% reduction on total toxic and CFC in air emission per unit product • total energy consumption increase 1% but products increase 4% each • Recycled about 26.7 million kg waste including 0.9 million kg paper • Total saving over USD 11million
Wilton Armetale - a non-ferrous foundry located in Lancaster County, Pennsylvania	• Reduced waste costs by about 40% over two years • Reused and recycled about 60-70% of the waste generated
Xerox Co.	• Conversion of solid waste to useable energy through incineration, saved over USD12 million in 1995 • Implemented a plastic recycling program, saved over USD 50,000 in 1995
IBM Co.	• Energy conservation activities saved USD15.1 million in 1995

.....continuation of Table 2.3: Examples of organisations that benefited from implementation of ISO 14001

Honeywell Inc.	• Energy use reduction of about USD 2.7 million annually (16 million kW) • Annual costs saved over USD 1.6 million
Nikko Hotel, Hong Kong	• Water use reduction of 13% per occupant
Harrah's Hotel & Casino, Las Vegas	• Reduced water and energy costs by about USD 70,000 annually – guests have been offered the option of reusing their towels and linens
Shangri-la Rasa Sayang Resort, Penang	• Reduced water consumption by about 290 litre for each room

Source: Kirby (undated) & Kadaruddin Aiyub (2000)

To gain an insight into the emerging state of practice regarding implementation of environmental management systems in UK organisations, the IEM (Institute of Environmental Management) issued a questionnaire to all its members. This seeks to examine the level of activity regarding ISO 14001 and EMAS, particularly in terms of the obstacles to EMS implementation and benefits anticipated from certification.

Identification, assessment and management of significant environmental impacts have been identified as one of the main pre-certification problem areas. Organisations found difficulty in interpretation and implementation of the standard regarding the assessment of aspects and impacts. Furthermore, problem encountered in developing clearer methodologies for identification and assessment of impacts was highlighted by certifiers as needing attention prior to certification.

According to a business case study conducted by Edwards *et al.* (1999) to obtain information and experience in the organisational implications of adopting the ISO 14001 EMS standard, the findings indicated 2 elements which are the main problem areas: one of it is the identification of environmental aspects and impacts.

During the National Seminar on Environmental Management 2001 held in Kuala Lumpur, Malaysia, speaker Aminah Ang who is a certification executive and ISO 14001 qualified auditor from SIRIM QAS Sdn. Bhd., highlighted some issues and challenges during auditing. One of the issues is regarding the methodology for aspects and impacts identification and evaluation (Ang, 2001).