

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

In the late 1980s, a new concept evolved that would result in a fundamental shift in the way environmental issues are viewed by society in general. This was the concept of sustainable development, introduced in a report entitled 'Our Common Future', by the World Commission on Environment and Development (the Brundtland Commission). This Brundtland Report, which was commissioned to examine long-term environmental strategies, argued that environmental protection could be made compatible, but that this would require radical changes in economic practices throughout the world. It was this notion of sustainability that led to the current awareness and interest in environmental management systems (EMS) and other non-traditional approaches to managing environmental impacts (Brundtland, 1991).

An environmental management system (EMS) as we know it today is fundamentally different from the type of reactive or ad hoc environmental management practiced in the past. Although it can incorporate many of the systems used to address regulatory compliance, an EMS requires a cultural change throughout a company. To better understand the concept of EMS, it is helpful to understand the concept of sustainability.

#### **2.2 The Concept of Sustainable Development**

An enduring society must be based on a system of commerce and production that is sustainable and restorative. Sustainable development is an approach that uses the earth's 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, biological and

human systems to create a sustainable system of commerce, and that governments need to incorporate flexibility that rewards proactive environmental management (Quadzi, 2002).

The Brundtland Report, commissioned by the United Nations defined sustainable development as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. In other words, mass consumption is not possible indefinitely and if society today acts as if all non-renewable resources are plentiful, eventually there will be nothing left for the future. But more importantly than that, mass consumption may cause such irreparable damage that humans may not even be able to live on the planet in the future (Brundtland, 1991).

The challenge that faces the economic system is how to continue to fulfil its vital role within modern society while working towards sustainability. Compliance with the principles of sustainability cannot be achieved overnight. However, both for entire economies and for individual businesses, there is hope that it can be achieved within the timescales which appear to be necessary if environmental catastrophe is to be avoided (Welford and Gouldson, 1993).

Sustainable development is made up of three closely connected issues (Welford, 1996):

1. **Environment:** The environment must be valued as an integral part of the economic process and not treated as a free good. The environmental stock has to be protected and this implies minimal use of non-renewable resources and minimal emissions of pollutants. The ecosystem has to be protected and the loss of plant and animal species avoided.
2. **Equity:** One of the biggest threats facing the world is that the developing countries want to grow rapidly to achieve the same

standards of living as those in the North. That in itself would cause a major environmental disaster if it were modelled on the same sort of growth experienced in post-war Europe. Therefore, there needs to be a greater degree of equity and the key issue of poverty has to be addressed. But it seems hypocritical for the North to tell the South that it cannot attain the same standards of living and consumption.

3. **Futurity:** Sustainable development requires that society, businesses and individuals operate on a different timescale. While companies commonly operate under competitive pressures to achieve short-run gains, long-term environmental protection is often compromised. To ensure that longer-term, inter-generational considerations are observed longer planning horizons need to be adopted and business policy need to be proactive rather than reactive.

The Brundtland Report concluded that these three conditions are not being met. The industrialised world has already used much of the planet's ecological capital and many of the development paths of the industrialised nations are clearly unsustainable. Non-renewable resources are being depleted, while renewable resources such as soil, water and the atmosphere are being degraded.

The Report calls for growth which is environmentally and socially sustainable rather than the current situation of unplanned, undifferentiated growth. This means reconsidering the current measures of growth such as gross domestic product (GDP) or gross national product (GNP) which fails to take account of environmental debits like pollution or the depletion of the natural capital stock (Welford, 1996).

### 2.3 Corporate Environmental Sustainability

Corporate environmental sustainability has been the mantra of many management theorists and forward thinking practitioners throughout the early 1990s (Gupta, 1995). As the next millennium arrives it is almost certain that this growth in corporate environmental consciousness will remain. For example, a recent survey of 1, 000 US manufacturers by Industrial Week found that 90 percent have environmental strategies and 80 percent believe they have environmentally-friendly or 'green' operational mechanisms (Sarkis, 2001).

There is evidence that many companies have taken a proactive approach to the management of environment concerns. These companies which differ in size, market of operations, context and culture, developed their own set of unique strategies and implemented them on their existing activities (Maxwell *et al.*, 1997).

The implementation of strategies can come about from two different levels – the corporate level and the business level – and different firms need to adopt different approaches to fit their organisational culture and structures (Dechant and Atiman, 1994). At the corporate level, leaders achieve their business goals by gearing their strategies and management to harness the market's potential for sustainability products and services while at the same time successfully reducing and avoiding costs and risks related to environmental liabilities.

The ultimate aim of corporate environmental management must be to reach a situation where companies are operating in a way which is consistent with the concept of sustainable development. The key idea which lies behind the concept of sustainable development is that there is a trade-off between continuous economic growth and the sustainability of the environment. Over time growth causes pollution and atmospheric damage. Sustainable development stresses the interdependence between economic growth and environmental quality. It is possible to make development and environmental

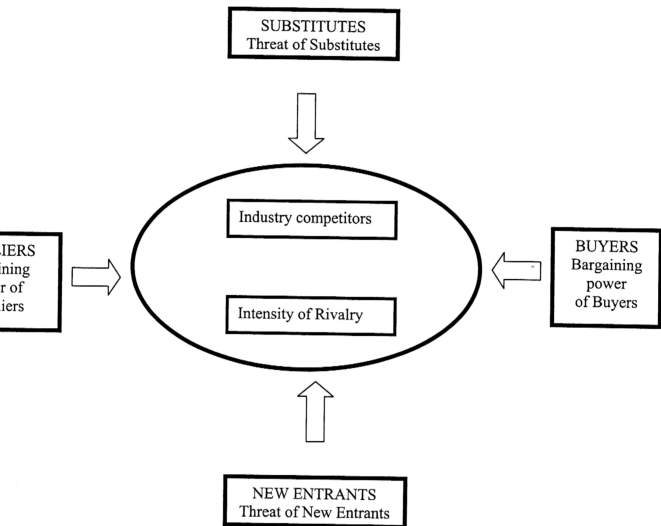


protection compatible by following sustainable strategies and by not developing the particular areas of economic activity that are most damaging to the environment (Welford, 1996).

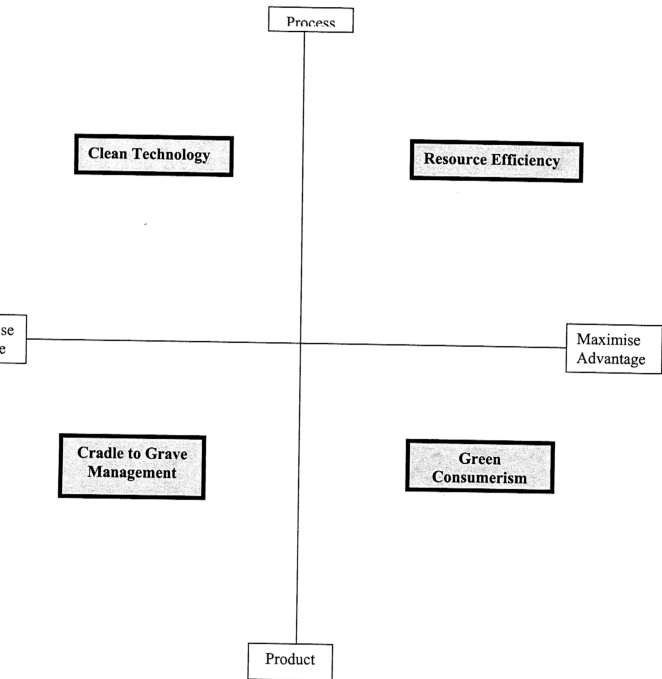
Greeno (1989) found that world-class companies are incorporating an environmental, health and safety perspective into their strategic planning as well as their daily operations-management decisions in order to ensure that their operations are not only in compliance with legal requirements but also are managed in an environmentally sound and responsible manner.

Porter's well-known framework (Porter, 1985) of the competitive forces that determine industry profitability can be used to indicate the nature of competition with regard to the environment in any particular industry (Beaumont *et al.*, 1993). The approach is summarised in **Exhibit 1**. Undoubtedly, the green revolution has been responsible for a number of new market entrants. For example, companies manufacturing greener and cleaner products have increased the threat of substitutes such as replacements for CFCs and aerosols etc.

In addition, greening of industry strategies have brought about changed relationships between companies and their suppliers and buyers. And within some industries the environment has brought about new levels of competition and rivalry. The two by two matrix shown in **Exhibit 2** sums up the strategic environmental framework proposed by Beaumont *et al.* (1993). It shows the various options available to companies for achieving competitive advantage.



**Exhibit 1: Industry Structure Analysis Framework**



**Exhibit 2: Alternative Positions to Achieve Competitive Advantage**

Companies are realising that proactive environmental management can prevent such disasters and result in a more effective organisation 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 (Soh, 1996a, b). However, the success of the system highly depends on commitment and cooperation from all levels and functions within the organisation (Wilson, 1997).

## **2.4 Environmental Management Systems**

A study undertaken by Booz *et al.*, 1991 of top executives in the chemical industry in the US revealed that the leading chemical companies believe that an integrated and holistic approach to the environment is required in order to incorporate it into the overall business strategy. This in turn requires the adoption of a proactive environmental strategy, as opposed to a passive or reactive strategy (Norcia *et al*, 1993).

No matter what the structure of the firm, it is the lack of a comprehensive and effective management system which can often lead to environmental damage and cost organizations heavily in terms of clean-up costs and damaged reputations (Knoepfel, 2001).

An EMS is a well-documented and structured approach to coping with regulations and customer requirements related to environmental issues. The system provides the framework for organisations to achieve continuous environmental improvement through the effective management of environmental impacts. It examines issues such as allocation of resources, alignment of responsibilities, and systemic evaluation of practices, procedures and processes (Wu and Tan, 1996).

The concept of EMS is not something new or unique. Many companies have had several of the elements that make up an EMS in place for years. In the United States, environmental regulations require many of the elements of an

EMS in some form or other. The concept of an EMS brings together a number of elements in a framework which provides for coordination of the various elements and allows management to systematically understand and control the many components of environmental management (Wilson and Sasseville, 1999).

The best-known common framework for EMS is the ISO 14000 series issued by the International Organisation for Standardisation (ISO). This series is based on the overall approach and broad success of the quality management standards prepared and issued as the ISO 9000 series. The ISO 14000 family of standards (i.e. ISO 14001, 14004, 14010, 14011 and 14012) were formally adopted as international standards in 1996. Adoption of the ISO 14000 series of standards is voluntary. (World Bank Group, 1998).

There are two other major EMS standards: the British Standard, BS 7750 (developed in 1992 and revised in 1994), which was one of the first broadly accepted systems and has been adopted by a number of countries, and EMAS (1993), the European Eco-Management and Audit Scheme. A process of harmonization has been under way to ensure reciprocal acceptability of these systems with ISO 14001. The BS 7750 and the EMAS are however, broader in their requirements than the ISO 14000 series. In particular, EMAS includes requirements for continued improvement of performance and for communication with the public, which are not addressed in the ISO 14001 (World Bank Group, 1998).

#### **2.4.1 ISO 14001**

The ISO 14000 series of standards has been developed and issued as a structured programme of continuous environmental improvement that follows procedures drawn from established business management practices with the primary objective of addressing and managing environmental issues (Wilson and Sasseville, 1999).

The ISO 14001 standard provides an environmental management system framework for planning, developing and implementing strategies and related programmes. It also requires the organization to evaluate its current and potential environmental exposures in terms of impact and compliance with legislation.

The standards within the ISO 14000 series that have been published are as follows (ISO, 1996b, c, d, e):

- **ISO 14001:** Environmental management systems: specification with guidance for use.
- **ISO 14004:** Environmental management systems: general guidelines on principles, systems and supporting techniques.
- **ISO 14010:** Guidelines for environmental auditing: audit procedures, auditing of environmental management systems.
- **ISO 14011:** Guidelines for environmental auditing: qualification criteria for environmental auditors.
- **ISO 14012:** Guidelines for environmental auditing: qualification criteria for environmental auditors.

Other related standards which were published in 1998 include:

- **ISO 14021:** Environmental labels and declarations: self-declaration environmental claims; guidelines and definition and usage of terms.
- **ISO 14040:** Environmental management: life cycle assessment; principles and framework.

These standards are designed to assist organisations regardless of their size and business type, to formalise a management process, and to evaluate the effectiveness of their activities, operations, products and services in the improvement of environmental and safety performance (Kuhre, 1995; Subhash, 1996).

The ISO 14001 EMS (a copy of the standard is presented in **Appendix A**) is built with core elements basically from proven management systems such as the ISO 9000 series (Lin, 1995; Abounaga, 1998) and stresses continual improvement and the dynamic, "plan-do-check-act" process. The elements structuring an EMS are largely governed by management by objectives, the need for organizational development and continuous improvement, and the measurement of environmental performance as well as the monitoring process and corrective action (Kuhre, 1995; Wever, 1996, Subhash, 1996).

The ISO 14001 standard has five major sections:

- environmental policy;
- planning;
- implementation and operation;
- checking and corrective action; and
- management review.

According to Abounaga (1998), the focuses of these sections are described as follows:

- The environmental policy relates to the current and potential environmental impact of the company's products and services, consumed material, pollution prevention and waste reduction.
- Planning includes identifying the controllable environmental aspects, legal requirements applicable to its operations, objectives and targets for various environmental aspects, and an environmental management programme to achieve its objectives.

- Implementation and operation includes the following: roles, responsibilities and authorities of employees reviewing performance of the environmental system; training, awareness and competence; controlled documentation of core elements and reference to related environmental documents; operational control; and emergency preparedness for handling accidents.
- Checking and corrective action includes monitoring and measurements for continuous improvement, tracking performance with its objectives and targets, calibration and maintenance of monitoring equipment, taking corrective or prevention action, keeping records and EMS audits.
- Management review entails periodical assessment of the EMS by management for its continuing suitability and effectiveness.

#### ***2.4.2 Decision Criteria of ISO 14001 Adoption***

The decision criteria and factors that might affect the adoption of ISO 14001 EMS has been the subject of extensive research (e.g. Clements, 1996; Quigley, 1997; Chin, et al., 1998; Pun et al., 1998). Many studies have been conducted primarily to investigate the strategies and practices of EMS adoption and implementation, and its impact on achieving the objectives of sustainable environment (e.g. Willig, 1994; Sayre, 1996; Chen, 1997, Aboulnaga, 1998).

Even though it is a voluntary environmental standard, most customers may require the certification to do business. There is concern that environmental performance may become an important commercial factor, either as a positive attribute or as a potential trade barrier (World Bank Group, 1998). The implementation of an EMS, and particularly the ISO 14001 system is seen as a way to demonstrate an acceptable level of environmental commitment.



The complexity in decision factors or decision criteria location, type and environmental impacts fundamentally influence the system and the way in which

The EMS adoption process Pun and Hui (2001), in which benefit considerations. Companies which are ISO 14001-certified data and qualitative factors is largely based on a wide range of functional areas, organisational and operation simulations environmental management decision criteria and benefits decision criteria typically used

The complexity in designing and implementing an EMS may depend on many factors or decision criteria including management and employee commitment, location, type and complexity of operations, level and number of environmental impacts and operations conditions of companies. They are all fundamentally influenced by the quality of the environmental management system and the way in which it is implemented in an organisation.

The EMS adoption process has been described as 'fuzzy and complex' by Pun and Hui (2001), involving numerous decision criteria, and cost and benefit considerations. Conventionally, managers and planners of companies which are ISO 14001-certified use their judgement weighing both quantitative data and qualitative factors in their decision-making process. Their judgement is largely based on a wide variety of supported information from different functional areas, organisational and environmental databases, financial, sales and operation simulations. In reviewing existing literature on the environmental management adoption and implementation process, several decision criteria and benefits have been identified. Table 1 provides a list of decision criteria typically used in the process.

**Table 1: Decision Criteria & Sub-Criteria of the ISO 14001 EMS Adoption**

Decision Criteria	Decision sub-criteria
1. Operational costs (OC)	1.1. Process costs (PRC) 1.2. Material costs (MAC) 1.3. Labour costs (LAC) 1.4. Overhead costs(OHC)
2. Company Image (CI)	2.1 Product quality (PRQ) 2.2 Service quality (SEQ) 2.3 Social responsibilities (SOR)
3. Market Trend (MT)	3.1 Government policies (GOP) 3.2 Market pressure (MAP) 3.3 Customer requirements (CUR) 3.4 Investors' interest (INI)
4. Company Performance (CP)	4.1 Operational effectiveness (OPE) 4.2 Sales turnover (SAT) 4.3 Customer satisfaction (CUS) 4.4 Employee commitment (EMC) 4.5 Emergency preparedness (EMP)
5. Environmental conservation (EC)	5.1 Energy conservation (ENC) 5.2 Green technologies (GT) 5.3 Waste minimisation (WMM) 5.4 Waste recycle (WRC) 5.5 Waste treatment (WTT)

Operating Costs of environmental significance requires careful examination (James and Bennett, 1995; Clements, 1996; Tali, 1997). These costs comprise process cost, material cost, overheads and other costs associated with environmental audits, product life-cycle assessments and the initial set-up, maintenance and improvement of an EMS. Companies that integrate environmental management into their manufacturing strategy appreciate that the product and process improvements and redesign associated with pollution prevention programmes help to reduce costs in a variety of ways including increased performance, increased yields, reduced use of hazardous materials, increased recycling of process by-products and increased recyclability of the end item. The Gulf Coast Acid Team, a task force of employees at Dow Chemical, recommended an installation of a state-of-the-art recycling system which resulted in an annual saving of US 20 million (Gupta, 1995).

As costs of raw materials become a larger percentage of a product's total cost, the cost of wasted materials emitted into the environment with no revenue return becomes a more significant competitive issue (Newman and Hanna, 1996).

Gupta (1995) reported that in a McKinsey & Co. survey, 92 per cent of some 400 Chief Executive Officers (CEOs) and top executives agreed that the environmental challenge is one of the central issues of the twenty-first century and 83 per cent agreed that companies need to assume responsibility for the products they manufacture (Gupta, 1995). Thus, it is anticipated that environmental expenditures will increase between 50-100 per cent to reach a global total of 3-6 per cent of revenue over the next decade (Wheeler, 1992).

Secondly, companies that have a strong commitment to environmental preservation and protection would promote a reputable Company Image, to make aware of their stand to potential customers. Generally, the community has several environmental concerns, such as pollution, recycling, noise, air, waste management, hazardous substances, in conjunction with the performance of a company. Provision of quality product and service and commitment of social responsibilities often are positive image-builders, and in turn become the mandatory elements for doing business (Clements, 1996; Pouliot, 1996). A survey carried out as early as 1990 (Levin, 1990) indicated that 27 percent of consumers in the US boycotted a product due to the environmentally unfriendly image of the manufacturer.

It is thus crucial for today's organisation to be able to manufacture and deliver quality products and services cost-effectively and minimise any adverse impact on the environment. Many recent studies have shown that the competitive edge of an organisation is related to strategic concerns about quality and environmental impact of product and services. Industrial consumers are now demanding for more detailed information on the processes used and the products made by their suppliers. Companies that can provide quality and environmentally friendly goods and services may have

greater potential to capture larger market shares and returns (Willig, 1994; Chen, 1997; Aboulhaga, 1998).

Conformance of products to customer satisfaction is an important sub-criteria. Product specifications are often influenced by environmental legislation as much as customer expectations. Sometimes, the tightening of existing regulations or the advent of new environmental regulations renders products, even those currently in production, obsolete. Competitive forces ensure that this cycle will continue. Hence, customers are more likely to prefer products which they perceive to be less likely to get caught in such a cycle of tightening regulations. Thus, their selection reduces the risk that they will be forced to pay more for product modification or replacement in response to future regulations (Newman and Hanna, 1996).

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 of 24 industrialised and developing nations considered environmental prevention to be more important than economic growth (Haklik, 1997).

Third, Market Trend is one of the determinants that govern the business operations and strategy formulation of most organisations today (Jo, 1990; Clements, 1996). The trend in turn is influenced by a set of sub-criteria which include, for example, the customer requirements that have integrated environmental values into their conceptions of product quality. Many customers are becoming more environmentally aware and are looking for eco-labels and certifications that give an indication of the manufacturer's environmental commitment (Clements, 1996).

Environmentalists and non-profit organisations such as Greenpeace and Friends of the Earth, the mass media and the public also enforce the market pressure of urging firms to stress environmental quality, advocate cleaner production and produce eco-friendly products (Pun *et al.*, 1998).

Compliance with government policies and regulations pertaining to environmental impacts often act as push factors for the adoption of an EMS (Sayre, 1996; Pun *et al.*, 1998). Furthermore, many business and regulatory agencies have recognised the importance of ISO 14001 registration, which has a tendency to become a prerequisite for doing business globally. Attaining ISO 14001 registration has now become the investors' interest that may lead firms to adopt and establish their EMS (Clements, 1996; Quigley, 1997).

The fourth criteria, Company Performance, is important as organisations that have a track record on environmental records would be at an advantage to improve their public relations with community and customer trust. The emergency preparedness that is concerned about safety and environmental issues would affect the company's performance (Clements, 1996; Chin *et al.* 1998). With these concerns, companies can better define customer requirements and respond quicker to attain customer satisfaction. The operations effectiveness of an organisation also improves its credibility with customers, and enhances its business performance (Chapman, 1994). Although implementing an EMS involves considerable amount of initial and on-going maintenance costs, a long-term reduction in environmental costs can help firms establish their competitive edge and boost sales turnover. Operating efficiency can be improved by reducing the operating costs, energy and disposal costs.

Studies have shown that companies have uplifted their public image and credibility by implementing ISO 14001. This is particularly important to the multinational and commercial companies, particularly the high-profile ones, who are expected to be pioneers in adopting a comprehensive EMS to maintain their leading position in the market. Organisations can also strengthen their staff training and empowerment with better communication and employee commitment (Pearson, *et al.*, 1993; Lau, 1997). Chin *et al.* (1998) showed that an organisation committed to the environment is more likely to bolster team spirit, engender loyalty and increase the organisation's

ability to attract committed staff (Pearson et al., 1993). Additionally, organisations adopting ISO 14001-based EMS may have a larger pool of potential employees to choose from their competitors giving them market advantage.

Fifth, studies have shown that firms could enhance their competitive position through effective Environmental Conservation (Liu, 1995; Sayre, 1996; Lee, 1997, Hong Kong Industry Department, 1998). Many environmental initiatives (such as cleanliness, cost-effectiveness and eco-friendliness) have been introduced in the industrial scene for the production of environmentally friendly or 'green' products and services. Product reformulation, process modifications and equipment redesigns are practical approaches that result in the reduction, recycling and reuse of waste (hazardous and non-hazardous) materials (Fussler, 1996; Hong Kong Industry Department, 1998). With the development of suitable waste treatment and disposal methods, industries can minimise adverse impacts arising from waste generation and disposal (Denton, 1994). As stated by Kuhre (1995), the greatest impact to the environment is the reduction of hazardous waste. On energy use patterns and resource depletion, energy conservation results in the reduction of environmental costs and thus improves a firm's competitive position.

Over the years, legal liabilities which include fines for non-compliances, personal liability and clean-up costs, associated with environmental impacts have also intensified. Many organisations now appreciate that by adopting an EMS, commercial and social gains can be accrued. Some companies have sharpened their competitive edges through adopting the EMS approach and related strategies and practices. Products that are environmentally friendly in production and in use may have greater marketplace appeal.

## 2.5 Analytical Hierarchy Process

The analytical hierarchy process (AHP) methodology, as devised by Saaty (1980) which provides a proven, effective means to deal with complex decision making and can assist with identifying and weighting selection criteria, analysing the data collected for the criteria and expediting the decision-making process. AHP helps to capture both subjective and objective evaluation measures, providing a useful mechanism for checking the consistency of the evaluation measures and alternatives suggested by the group of evaluators thus reducing bias in the decision making (Saaty, 1990).

Any complex problem can be decomposed into several sub-problems using the AHP in terms of hierarchical levels where each level represents a set of criteria or attributes relative to each sub-problem. The top level of the entire hierarchy represents the goal (such as the implementation of ISO 14001 based EMS) of the problem (Saaty and Vargas, 1994).

The intermediate levels represent the strategic as well as the operational factors and the last level usually represents alternatives or actions to be considered to achieve the goal. Decision elements at each hierarchy level are compared pair wise and are assigned relative scales that reflect the strength with which one element dominates another. Based on these pair wise comparison matrices, local and global priority weights are determined and the ranking of the alternatives occupying the last level of the hierarchy will be made to satisfy the overall goal of the problem (Tummala and Wan, 1994).

Some examples of the AHP applications include assessing and prioritising criteria/alternatives in new product designs, new product pricing, product selection, use of technologies, facilities locations/layouts and supplier selection (Tummala and Wan, 1994).

Pun and Hui (2001) successfully used the AHP methodology to establish a decision model for ISO 14001 adoption in industries in Hong Kong which



could be used as a practical management guide by environmental managers. A similar study (Chin and Chiu, 1999) was carried out to evaluate the success factors of the ISO 14001-based EMS in the manufacturing sector in Hong Kong using the AHP methodology.

## **2.6 Conclusion**

In this study the AHP process, which has been primarily used to assist in the analysis and decision-making process, will be used to evaluate the critical decision criteria, sub-criteria and benefits of the ISO 14001 which have been identified from existing literature and previous empirical studies in the adoption and implementation of the ISO 14001 based environmental management system in the oil and gas industry in Malaysia.