ENVIRONMENTAL MANAGEMENT SYSTEMS IMPLEMENTATION

by

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Environmental Management Systems Implementation

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Abstract

All organisations make some contribution to the degradation of the environment through their use of resources and production of waste. Environmental management systems (EMS) standards can provide a tool for companies to systematically reduce their environmental impacts. ISO 14001 was published in 1996. This fitted in with plans of the case study company to take proactive action in this area, even though there was no legislative requirement for them to do so.

As EMS implementation was a new area at the time, appropriate methodologies were developed to address different aspects of the implementation, and ISO 14001 was successfully implemented in the company.

The results of the primary research included:

- Drawing up a methodology for identifying and interpreting the environmental legislation that may have an impact on the organisation and compiling a register of such regulations.
- Developing a robust methodology for assessing significant environmental aspects and impacts and applying this to the software company.
- Establishing objectives and targets for those aspects identified as significant and implementing environmental management programmes to meet these.
- Developing an internal environmental audit procedure based on auditing against the significant aspects.
- Integrating areas of the EMS with the existing quality management system in order to avoid duplication of effort.
- Undergoing an external assessment process in order to achieve certification of the system.

The thesis concludes that the systematic approach defined in ISO 14001 provided a mechanism that the organisation was able to adopt to bring about improvement in its environmental performance. The system was based on a thorough evaluation of the organisation's significant environmental aspects in order to bring about a reduction in its negative impacts. The ISO 14001 requirement for continual improvement is the key driver of the system, and this is what differentiates it from ISO 9000.

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ABBREVIATIONS

BATNEEC	Best Available Technology Not Entailing Excessive Cost
CAR	Corrective Action Request
CD	Compact Disk
CFC	Chlorofluorocarbon
CPI	Chemical Process Industry
EIA	Environmental Impact Assessment
EMAS	Eco-Management and Audit Scheme
EMP	Environmental Management Programme
EMS	Environmental Management System
EMT	Environmental Management Team
ENDS	Environmental Data Services
EPA	Environmental Protection Agency
EU	European Union
FMEA	Failure Mode and Effects Analysis
IEM	Institute of Environmental Management
IPC	Integrated Pollution Control
IPPC	Integrated Pollution Prevention and Control
ISO	International Organisation for Standardisation
JIT	Just-In-Time
LCA	Life Cycle Analysis
LPD	Licensed Disk Pack
MOU	Memoranda of Understanding
NGO	Non-Governmental Organisation
NSAI	National Standards Authority of Ireland
ODS	Ozone Depleting Substance
OHS	Occupational Health and Safety
PC	Personal Computer
PVC	Polyvinylchloride
QMS	Quality Management System
RPN	Risk Priority Number
S.I.	Statutory Instrument
SME	Small and Medium-Sized Enterprise
UKAS	United Kingdom Accreditation Service
VOC	Volatile Organic Compound
WCM	World Class Manufacturing

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INTRODUCTION

Background

The worldwide uptake of environmental management systems has begun. If quality was the big issue in the eighties, the environment is coming into its own in the late nineties. Threats to sustaining the quality of human life on our planet make the environment an even bigger issue than product and service quality. As quality focussed on satisfying the customer's needs, now we need to expand the definition of customer satisfaction to include environmental issues and to treating our environment as a customer. The onus to act does not just apply to 'dirty' industries that have the potential to cause significant pollution. 'Clean' industries, i.e. those that do not cause significant quantities of emissions to the atmosphere or discharges to water, still consume resources and produce waste. When taken together, these industries also make a significant impact on the environment.

The implementation of an environmental management system (EMS) is not a straightforward matter, either in motivation or in practice. Reasons for implementing an EMS and the way in which it should best be done bear investigation. We have learnt a lot from the quality experience, but an additional set of skills is required to embark upon the environmental journey.

Objectives

The main objectives of this thesis are outlined below:

- To review the literature in order to present an argument as to why all organisations, including those in seemingly 'clean' industries, have a key role to play in the pursuit of sustainable development
- To review the role of legislation in persuading companies to act
- To interpret the requirements of the EMS standard, ISO 14001, and to address some of the key issues facing any organisation undertaking its implementation
- To determine a practical method for identifying the key environmental legislative requirements and to apply this to a software company operating in Ireland
- To examine the existing methodology for determining the environmental aspects and impacts of the software company and, on the basis of this, to develop a more robust methodology for determining those that are significant
- To establish environmental objectives and targets and to initiate environmental management programmes in order to achieve these in the software company
- To examine opportunities for the integration of management systems
- To examine how internal environmental audits can be effectively used to bring about environmental improvement
- To bring the case study company successfully through the certification process.

Methodology

An extensive literature review was carried out and the main findings are described in Section I. The primary research is described in Section II. Section III contains the final conclusions of the thesis.

The primary research was carried out in a software company, which is part of one of the most successful organisations in the world today. As the decision to implement an EMS had already been made by the company, the primary research concentrates on describing key aspects of the implementation experience. The author gained first-hand experience by playing a key role in the actual implementation of ISO 14001 in the company.

Section I

LITERATURE REVIEW

Chapter One

The Global Problem and Why Industry Should Act – The Ethical Imperative

1.0 Introduction

This chapter attempts to put the environmental problems facing our planet in context, first from a global perspective, then looking at the situation in Europe and, more specifically, in Ireland. The concept of sustainable development is introduced as a response to the environmental problems and the notion of sustainability is explored. The chapter concludes by arguing that industry has a key role to play in achieving sustainability, and that all companies, not just those thought of as 'dirty industries', have an obligation to act.

1.1 External influences on organisations – the global challenge

To establish the magnitude of the challenge facing global industry, Stikker (1992) summarises the scenario presented by Paul Ehrlich's famous equation:

Global Environmental Burden	=	World Population	x	GNP per capita	x	Environmental impact per unit of GNP

A global population of 5 billion was first reached in 1987, when consumption and population levels gave rise to a global environmental burden which exceeded the sustainable carrying capacity of the earth, i.e. the planet's natural ability to assimilate human wastes and to regenerate resources.

Since 1950 industrial output has increased seven times and from 1950 - 1987 the global population doubled. If the world population doubles again to reach 10 billion in 40 years time, and the standard of living for the vast

majority of the world's population is improved by, say, 5% per year, then this would indicate a fivefold increase in GNP per capita by around the year 2035.

For the global environmental burden to remain constant at a nominal level of 1, for example, while the world population increases by a factor of 2 and global consumption by a factor of 5, then the environmental impact per unit of GNP would have to show a reduction of 90% from its present level.

The situation is further complicated by the unequal division of resources among the world's population and the pressures on the developing world to catch up with the living standards of the more developed countries. Hart (1997) illustrates this by describing the concept of ecological footprints, defined as "the amount of land required to meet a typical consumer's needs". It takes 12.2 acres to supply the average person's basic needs in the United States. In the Netherlands, it takes 8 acres, and, in India, 1 acre. The Dutch ecological footprint covers 15 times the area of the Netherlands, whereas India's footprint exceeds its area by only about 35%. If the entire world lived like North Americans, it would take three planet Earths to support the present world population (see Figure 1-A). Ireland's ecological footprint has been calculated as 5.95 acres per person, or some 1.23 times the size of the State (Department of the Environment, 1997).

Figure 1-A: Ecological footprints

(Source: Hart, 1997)

It is clear therefore that the developed world bears a disproportionate responsibility for the depletion and degradation of the global environment and natural resources, and must therefore demonstrate leadership. This recognition has been slow in coming. In the 1960s and 1970s corporations were in a state of denial regarding their impact on the environment. It took a series of highly visible ecological problems such as Lake Erie dying in the United States, the Rhine on fire in Europe and people dying of mercury poisoning in Japan for a groundswell of support for strict government regulation (Hart, 1997). The worsening condition of the environment has been widely acknowledged and is now being studied and monitored by many agencies.

1.2 The European situation

In 1995, the most comprehensive assessment ever conducted on the environmental condition of Europe - *"Europe's Environment: The Dobris Assessment"* was published. The report confirms the poor quality of Europe's environment and identifies twelve especially serious problems:

- climate change
- stratospheric ozone depletion
- loss of biodiversity
- technology-related accidents such as oil spills
- acid deposition
- photochemical smog
- freshwater management
- coastal zone problems and management
- waste reduction and management
- urban environmental problems
- human exposure to potentially toxic chemicals
- forest degradation (Burke, 1996).

1.3 The Irish situation

In 1996, the Environmental Protection Agency (EPA) published a "*State of the Environment in Ireland*" report (Stapleton (ed.), 1996). Some of the recent environmental trends and pressures in Ireland highlighted in the EPA report are summarised in Table 1-I.

Water
- There was a significant increase in 1991 - 1994 in slight to moderate water pollution, now up to 28% of measured river channel length
- 39% of lake surface area examined in 1991 - 1994 was moderately to seriously enriched

Natural resources/landscape
- 18% of flowering plant species and 18% of fauna are threatened with extinction
- Important habitats for many upland bird species have been severely damaged by excessive sheep stocking in hill and mountain areas
- The remaining area of raised bog of conservation importance is now 6% of the original total area of raised bog

Waste
- Overall waste generation in Ireland has been growing by some 4% per annum for at least a decade
- At least 100,000 tonnes of hazardous waste now arise each year

Energy
- Total primary energy requirement increased by 24% between 1980 and 1993
- Energy consumption per capita is increasing

Transport
- Vehicle kilometres travelled per capita increased by 47% between 1986 and 1995

Table 1-I: State of the environment in Ireland
(Source: Department of the Environment, 1997)

The EPA report shows that Ireland's environment, while still generally of a high quality, is affected by a number of adverse trends and serious threats.

1.4 Sustainable development - the global response

In response to the serious threats to our natural environment, the concept of 'sustainable development' was defined by the World Commission on Environment and Development (1987) as

> **development that meets the needs of the present without compromising the ability of future generations to meet their own needs.**

Sustainable development recognises that the actions of the present affect the inheritance of future generations. The concept is based on universal principles which are relevant to all nations and peoples. These principles are contained in the Rio Declaration on Environment and Development, and are outlined in Table 1-II.

- Environmental protection should constitute an integral part of the development process
- Developed countries accept responsibility for their disproportionate pressure on the global environment
- Unsustainable patterns of production and consumption should be eliminated
- Effective environmental legislation should be enacted
- Access to environmental information and public awareness and participation in decision-making should be facilitated
- The precautionary approach should be applied, environmental impact assessment should be undertaken for activities likely to have a significant environmental impact, and internalisation of environmental costs should be promoted
- The needs of the least developed countries should be given special priority.

Table 1-II: Principles contained in the Rio Declaration on Environment and Development (Source: Department of the Environment, 1997)

Clearly the world's future prosperity - even its very existence - depends on using no more of its natural resources than it can be expected to replenish.

According to Power and Cox (1994) this will mean major changes in the lifestyle of developed countries, currently making up about 25% of the world's population, but using 70% of its resources. Industrial growth and development are set to continue but must do so within the bounds of environmental limits. The concept of sustainability is a product of the developed world and cannot simply be foisted on developing countries trying to catch up.

McDonagh and Clark (1995) see the development of consumerism to a large extent as the cause of many of the problems we are facing today. The 'banana example' described in Table 1-III reflects how environmental education bridges the generation gap.

A mother learned her housekeeping skills in wartime and austerity. If she buys three bananas from a shopkeeper, the family eats three bananas. One child is a product of the affluent '70s. He or she buys three bananas, goes off the idea of eating bananas, and throws one away. But his or her nieces – in the vanguard of the next environmentally aware generation - buy only two bananas, based on the reasoning that this avoids waste and over-consumption.

Table 1-III: Banana example
(Source: McDonagh and Clark, 1995)

Power and Cox endorse this thinking, and put forward the notion of "universalisability" as a guideline way to determine the rightness for living - i.e. by asking

"Would it be right if everyone did it?"

Sustainability considers not just its rightness for humankind, but for the entire ecosystem, as well as for future generations, taking into account both a spatial axis of different places and a temporal axis of different times from the past to the future.

1.5 Sustainable corporations

The explosive population growth and rapid economic development in the emerging economies contribute massively to the global environmental problem. Nevertheless, the responsibility lies with the developed countries, as the greatest consumers and polluters, to lead the way in developing a sustainable global economy. Hart (1997) suggests that although the roots of the problem are political and social, at the same time corporations are the only organisations with the resources, the technology, the global reach, and ultimately, the motivation to achieve sustainability. Shrivastava and Hart (1995) point to at least four strongly motivating forces which should prompt corporations to worry about such seemingly large and abstract issues. Firstly, increasingly stringent national laws and new international treaties will create a political imperative. Secondly, sustainability is becoming a competitive issue for companies. Thirdly, there is a growing popular sentiment that nature has a right to exist for its own sake, not just for human welfare, creating an ethical imperative. Finally, resolving environmental problems is inextricably tied to economic development issues, particularly in developing countries, creating a global imperative.

Based on Ehrlich's formula introduced by Stikker at the beginning of this chapter, achieving sustainability will require stabilising or reducing the environmental burden, by

- decreasing the human population,
- lowering the level of affluence (consumption), or
- fundamentally changing the technology used to create wealth (Ehrlich and Ehrlich, 1991).

The societal issues of population and consumption are not easily tackled, and are issues that exceed the mandates and capabilities of any corporation. This leaves the third option of changing the technology used to create the goods and services that constitute the world's wealth in order to reduce the consumption of resources and the production of waste. Hart is more pessimistic than Stikker. He calculates that economic activity will have to increase tenfold over what it is today just to provide the basic requirements for a population double its current size, and therefore technology will have to improve twentyfold merely to keep the planet at its current levels of environmental burden. Whatever the statistics used, a vision is still needed to guide companies through the stages of environmental strategy necessary to achieve sustainability.

1.6 Why 'clean' companies should play a part

Hart (1997) cautions that those who think that sustainability is only a matter of pollution control, and the responsibility, therefore, of large 'dirty' industries are missing the bigger picture. Even if all the companies in the

developed world were to achieve zero emissions by the year 2000, the earth would still be stressed beyond its carrying capacity.

In addition to emitting more waste to the air, land and water than can be naturally assimilated, we are consuming many natural resources faster than they can be renewed. Non-renewable resources such as oil, metals and other minerals, are finite, yet we exploit and waste them.

The challenge is for companies to go beyond operational and technical solutions, such as bottom-up pollution-prevention programmes, to strategy and technology development to achieve sustainability (Hart, 1997). Dobers (1997) advocates that a systems-oriented strategy should be adopted as a new way of doing business today. For example, in the case of products, a 'cradle-to-grave' approach is required. This considers the ecological consequences arising from a product, starting at the design stage and continuing through production, distribution, use, reuse, recycling and disposal stages. This perspective implies that not only industry, but all sectors and organisations in a society must look at what environmental impact they have and search for ways in which they can contribute to bringing about an improvement.

Problems such as habitat destruction, biodiversity and climate change are extremely complex and solving them involves the difficult task of changing the behaviour of people and organisations. According to Hart, where today's responsible businesses strive for zero impact on the environment, tomorrow's businesses must learn to make a positive impact.

1.7 Conclusion

It is clear that our planet is on an unsustainable course, should we continue to exploit and disregard it as we have been doing. In this chapter we looked at how the impact on the environment is a function of population, affluence and technology. As the population increases, so does material consumption and waste production. We must come up with ways of making more with less, i.e. using less raw materials and energy, and producing less waste. While it is each individual's responsibility to leave the planet as we found it to be enjoyed by future generations, there is a particular onus on industry to act as it alone has the ability to change the technology used to produce the goods demanded by the growing population. It cannot simply be left up to a few individual companies to act. Every company has contributed to the problem, so the onus is now on every company to work towards a solution.

Chapter Two

External Pressures Through Law - Regulatory and Voluntary Approaches to the Environmental Problem

2.0 Introduction

In this chapter the changing role of legislation in response to the worsening state of the environment is explored. A new paradigm is described, and an example is given of how this has been successfully adopted in Sweden. Ways in which regulatory approaches are persuading companies to act are then described.

2.1 The development of environmental legislation

Frosch (1995) traces three distinct stages of environmental regulation since governments launched their first comprehensive attempt to improve the quality of the environment on Earth Day 1970.

- The first stage was "end-of-pipe" regulation, which placed restrictions on the types of materials that could be discarded, where they could be discarded, and by what means. These 'command-and-control' laws and regulatory systems attempted to prevent certain materials from entering the waste stream altogether
- The second stage of regulation focused on reducing pollution at source, namely, within industrial processes themselves. Reduction was the first priority, followed by recycling, and then treatment and disposal
- The third stage has been environmental regulation encouraging "clean production", - production processes that use fewer toxic materials and that lead to fewer and less toxic effluents.

A paradigm shift is taking place in response to current more complex environmental problems which require new remedies and the use of more sophisticated techniques (see Table 2-I).

OLD	NEW
Environmental protection and economic growth seen as opposed	Sustainable development links environment / economy decision making
Focus is on local problems	Focus is on regional, global problems
Agenda driven by domestic consideration	Agenda responsive to international trade and climate for investment
Public looks to government to prioritise problems, find solutions	Public participation in identifying problems and developing solutions
Jurisdictional fragmentation leads to duplication and overlap	Jurisdictional co-operation strives to eliminate duplication and overlap
Mindset is react and cure	Mindset is anticipate and prevent
Command-and-control is instrument of choice	Broad array of instruments, including voluntary action and economic instruments, are utilised
Regulations prescribe technical solutions, inhibit innovation	Performance standards give industry flexibility, encourage innovation
Addresses large point sources of pollution which are easy to identify and manage	Addresses diffused and difficult to manage nonpoint sources of pollution

Table 2-I: Change in paradigms

(Source: Johannson, 1995/96)

Under this new paradigm, innovation has been identified as the key to economic growth and renewal. The case is presented for an environmental policy regime promoting voluntary initiatives. These initiatives build on existing legislation while still allowing industry the flexibility to be innovative (Johannson, 1995/96).

Research by Porter and van der Linde (1995) supports the view that benefits can be derived from a well-framed and supportive regulatory framework. They argue that properly designed environmental standards can trigger innovations that lower the total cost of a product or improve its value.

Traditionally, regulators have tended to set regulations in ways that have deterred innovation, and companies, in turn, have opposed and delayed such regulations instead of innovating to address them.

Porter and van der Linde stress that regulation, in the new form, is needed for the following major reasons:

- To create pressure that motivates companies to innovate
- To improve environmental quality in cases in which innovation and the resulting improvements in resource productivity do not completely offset the cost of compliance
- To alert and educate companies about likely resource inefficiencies and potential areas for technological improvement
- To raise the likelihood that product innovations and process innovations in general will be environmentally friendly
- To create demand for environmental improvement until companies and customers are better able to perceive and measure the resource inefficiencies of pollution
- To level the playing field during the transition period to innovation-based environmental solutions, ensuring that one company cannot gain position by avoiding environmental investments.

Clarke (*cited by* Anon., 1994) agrees that creative regulatory reform is needed. It should be aimed at significantly increasing the cost-effectiveness of compliance measures by reducing command-and-control approaches, increasing the flexibility for meeting standards, and relying on market-based incentives. He supports Porter's "innovation offsets". As companies face

higher costs for polluting activities due to regulation, they will be pushed to consider new technologies and production approaches that might reduce the cost of compliance. An example of this is where semiconductor makers, when forced to abandon the use of chlorofluorocarbons (CFCs) as a solvent, discovered several lower cost ways to clean computer chips. While addressing environmental issues because of regulation, companies may develop entirely new products and processes.

Clarke places responsibility on governments for establishing regulatory conditions that promote economic creativity and efficient business responses to environmental demands. Regulatory programmes should be flexible and performance oriented, or based on economic incentives such as pollution charges.

2.2 The changing role of environmental legislation

Dobers (1997) compares different control strategies that have been implemented in Germany and in Sweden. In Germany, the strategy described in Figure 2-A was used to control single, identifiable and measurable emission sources such as those contributing to air pollution. The control process was based on the hierarchical system whereby the control of emission levels was delegated from national to regional agencies. Enacting new legislation tightening emission levels created a demand for new air pollution control systems, and thus created new markets. Described as 'bubble markets', these markets move from country to country depending on time lags in the national implementation of legislation.

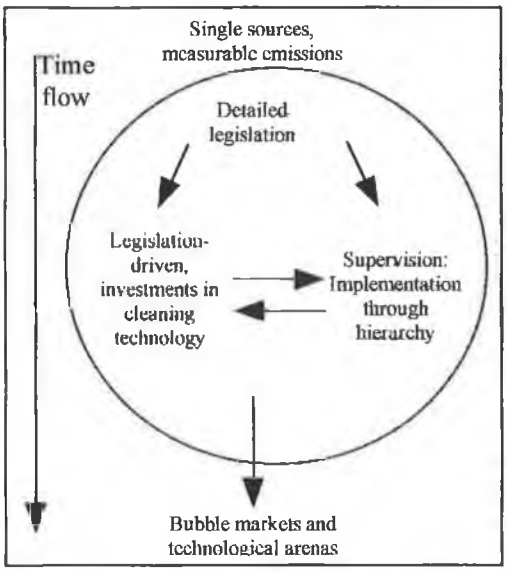

Figure 2-A: Regulatory control strategy in Germany and its implementation structure

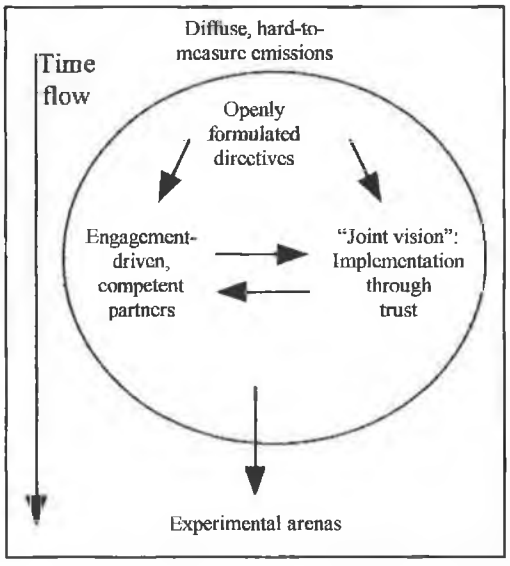

Figure 2-B: Reformative control strategy in Sweden and its implementation structure
(Source: Dobers, 1997)

This approach was also originally pursued in Sweden and led to substantial decreases in emissions of sulphur dioxide to the atmosphere. Once Sweden had dealt effectively with the most prominent problems, openly formulated directives were then used to combat the more problematic area of diffuse, hard-to-measure emissions. The strategy illustrated in Figure 2-B was pursued. The formulation and implementation of environmental improvement activities became a regional matter. Experimentation was possible, which in some cases led to different ways of dealing with environmental problems. Learning processes could be initiated through experiments, and experience could be spread to industry and municipal agencies. Leadership of a 'joint-vision'-oriented agency created a spirit of co-operation and partnership. The role of agencies under these conditions was to search for and bring companies together in an environmental network, where experiences from practical environmental actions could be exchanged. The outcomes of this 'reformatory regulation' were that all the necessary

groups were involved in the problem-solving process, and a local climate and arena for innovation and experimentation developed.

Sweden's environmental policy is based on a number of fundamental principles of environmental protection, which are listed in Table 2-II. These are embodied in the overall philosophy that, while economic growth could be advanced more rapidly if the level of environmental protection afforded to the country was reduced, this would probably have a significant adverse affect on the nation's future prosperity (Chadwick *et al.*, 1996).

1	Sustainable Development	Respect for man's and the environment's tolerance limits
2	Use of best available technology and good environmental practice	Substitution of hazardous substances and the use of best internationally available technology
3	Substitution Principle	All importers, manufacturers, users and consumers to use the least hazardous chemical available that can achieve the required effect
4	Precautionary Principle	Prevention of development or use of substances before conclusive evidence of their detrimental effect
5	Polluter Pays Principle	Liability for environmental protection and other environmental costs increases the chance that the pricing of end-products will reflect their real cost
6	Respect for each country's supremacy over its environment	Safeguards each country's right to be master of its own environment
7	Adherence to Agenda 21	New legislation post-Rio has been introduced

Table 2-II: Sweden's fundamental principles of environmental protection

[Source: Swedish Environmental Protection Agency, Environmental Protection: The Swedish Experience, (Solna, Sweden: Swedish EPA, 1993), *as cited by* Chadwick *et al.*, 1996]

2.3 Other environmental initiatives developed

When faced with the threat of stricter governmental regulation, industry is tending to seek to self regulate. Johannson (1995/96) describes four categories of voluntary initiatives already in effect in Canada (see Table 2-III).

❖ Environmental performance improvement by industry sectors through memoranda of understanding (MOU), e.g. MOU among representatives of Motor Vehicle Manufacturers Associations and Ministries of the Environment to reduce persistent toxic substances as well as other environmental contaminants of concern
❖ Where the industry association takes the lead and 'encourages' its members to improve their environmental performance, e.g. Responsible Care Programme in the Chemical industry
❖ Environmental performance improvements made by individual companies
❖ The ISO 14001 standard, which allow companies to benchmark their environmental management system against the ISO standard

Table 2-III: Voluntary initiatives
(Source: Johannson, 1995/96)

The threat of potential trade barriers, such as those resulting from the European Eco-Management and Audit Scheme (EMAS), has also prompted companies in the US to push towards "voluntary" or proactive environmental management systems (Bird, 1995).

The success of these voluntary initiatives is qualified by Nash and Howard (*cited by* Angel and Huber, 1996). They argue that, in the absence of strong internal drivers within the companies themselves, voluntary external standards are rarely a powerful independent force towards the greening of industry. Nevertheless, legislation still has an important role to play in ensuring that some action is taken.

2.4 EU Regulations

The EU's Fifth Action Programme has recognised the need to broaden the range of instruments used by the Union to tackle the continued environmental degradation in the Union. It defines a new set of instruments designed to complement the traditional command-and-control type of legislation already widely used at EU and Member State levels. These include:

- market based tools and other economic instruments
- research and development, information, education and training
- financial support mechanisms, and
- voluntary based schemes (Hillary, 1995).

Hillary describes how the Eco-Management and Audit Scheme (EMAS) bridges three of the new instruments indicated above. It is a voluntary scheme and a market based tool that also embodies the principle of providing more information to the general public about industry's environmental performance.

The impact of some of the new directives on the chemical process industries (CPI) is described in Table 2-IV.

REGULATORY CHANGES AFOOT IN BRUSSELS in 1996		
LEGISLATION	*EXPECTED*	*WHAT IT DOES*
Integrated Pollution Prevention and Control (IPPC)	Adopted in March 1996. Member states must implement by 2004	Issues a combined permit for most CPI plants, regardless of waste volumes generated
Voluntary Eco-Management and Audit Scheme (EMAS)	Voluntary programme began in 1996. Over 130 sites registered in that year.	Calls for third-party audits for companies in all manufacturing industries
Environmental Impact Assessment (EIA)	Final adoption expected by end of 1996	Requires assessments for all new CPI plants
Amendment to lower the size of plants covered by the Large Power Plant Directive (88/609)	Expected late 1996	Makes law cover smaller units (<500 MW), including most refinery steam boilers
Water Legislation to amend prior Discharges Directive (76/464)	A Framework directive expected in 1996	Would cover installations not covered by IPPC
Emissions Release Inventory	On hold	Would require taking inventory of toxins and releasing data to the public
Energy Tax	On hold	Tax on fuels. Denmark, Sweden and the Netherlands have already implemented
Basel Convention	European Parliament has already adopted it	Would strictly regulate the international shipment of wastes

Table 2-IV: European legislative situation relating to CPI in 1996
(Source: Fouhy, 1996)

Integrated regulatory systems that address air, water and waste problems systematically and comprehensively are more apt to lead to innovation offsets. Fouhy believes that these are likely to have the greatest impact on CPI operations. Replacing multiple permits, the directive on Integrated Pollution Prevention and Control (IPPC) requires companies to seek a combined permit for emissions to air, water and land for each site. Describing how the implementation of integrated pollution control (IPC) regulations aims to improve the environmental management and performance of the most polluting and complex industrial processes, Smith[①]

(1996) argues that IPC and environmental management systems (EMS) standards such as ISO 14001 can be complementary systems. The activities required for IPC place industrial operators in a good position for implementing a formal EMS, as IPC forces operators to begin to address the management of their environmental performance in a systematic manner. In Table 2-V ISO 14001 is compared and contrasted with IPC.

ISO 14001	IPC (UK)
Level of application is the site or business	Level of application is the industrial process
Accreditation is voluntary	Authorisation is a statutory requirement for proscribed processes
Produce a baseline environmental aspects and impacts evaluation	Monitor levels of environmental releases and assess their impacts
Seek continuous environmental improvements 'but not necessarily in all areas of activity at all times'	Upgrade process to the BATNEEC for new processes within four years
Objectives and improvement targets set internally by the operator	BATNEEC targets set externally by the pollution inspector and periodically tightened
Accreditation secured through documentation and maintained through periodic audits	Authorisation secured through documentation and maintained through submission of monitoring returns to the EPA, backed up by inspection visits from EPA inspectorate
Documentation confidential to the operator and the accreditor	Documentation placed on the public register
Sanction involves withdrawal of certificate	Sanction includes prosecution: fines and imprisonment

Table 2-V: Comparison of ISO 14001 and IPC
(Source: adapted from Smith[1], 1996)

Smith writes that one of the differences between ISO 14001 and IPC is the level of transparency. The legitimacy of claims that industrial environmental performance is improving can be checked against IPC documentation on the public register. According to Smith, analysis of this information gives a better

indication of the state of industrial EMSs than a count of ISO 14001 certificates on the walls of company reception areas around the country.

Another example of the 'new breed' of environmental legislation is the emergence of Packaging Waste Regulations in response to the EU Packaging and Packaging Waste Directive (94/62/EC). These regulations are designed to improve the efficiency with which resources are used and to minimise the environmental impacts of products across their life cycle. The Regulations seek to make producers more aware of the real environmental cost of production and disposal of the packaging of their products (Institute of Environmental Management (IEM), 1997).

De Clercq *et al.* (1996) argue that even for regulatory approaches that firms resist (e.g. ecotaxes), there is a large benefit to be gained by including industry in co-operative consultations over the design of regulatory programmes. Programmes imposed without consultation beg a conflictual response and often fail to meet their intended goals. Nevertheless, they often serve as a stick by prompting industry to introduce their own programmes as alternatives.

2.5 Conclusion

The approaches taken by governments to address the global environmental problem were explored in this chapter. The original 'command-and-control' legislation addressed large 'point' sources of emissions, and was successful in reducing the most prominent emission sources. The limitations of such approaches are acknowledged, however, when it comes to tackling numerous

diffuse, hard-to-measure emissions. Sweden is leading the way in adopting the new approach. A broad array of instruments, including voluntary action and economic instruments are utilised in the new paradigm. Performance standards have emerged to give industry flexibility and to encourage innovation. While IPC licensing is an example of a new approach that is forcing companies to address their emissions to all media (air, water and land) in an integrated manner, it still only applies to the most polluting industries. This type of regulation still does not address the combination of impacts from other companies, which may not be significant polluters on an individual basis, but are so collectively. All companies consume resources, and reducing consumption is now only beginning to be addressed by legislation such as the new Packaging Regulations. The recent phenomenon of EMS standards is providing a voluntary mechanism for industry to self-regulate its environmental activities. Open to participation from all types of industry (including service organisations), market forces may influence their uptake on a much wider basis. The success of these voluntary initiatives will be dependent on the motivation of the companies that adopt them.

Chapter Three

The Development of

Environmental Management Systems Standards

3.0 Introduction

In this chapter the emergence of formal environmental management systems (EMS) standards is explored. The benefits of implementing an EMS are described. The main elements of the international standard, ISO 14001, and the European Eco-Management and Audit Scheme (EMAS) are outlined. Integrating the EMS with other management systems is considered as a logical step.

3.1 Development of the ISO 14000 series

The International Organisation for Standardisation (ISO) was established in 1946 for the principal purpose of standardising industrial and consumer products moving across national borders. In the 1980s, ISO departed from its traditional technology and engineering mandate by working on a 'soft' management issue: quality management systems, and developed the ISO 9000 series. This was underpinned by a certification process that designates a company as having implemented a quality management system.

With the ISO 14000 series, ISO leaves the industry-client realm and enters into a field of significant public interest: the environmental performance of companies. There has been some criticism of this move by ISO, insofar as costs of participation in the drafting and decision-making processes present a barrier to many non-governmental organisations (NGOs), small and medium-sized enterprises (SMEs), and developing countries (Gleckman and Krut, 1996).

However, most environmental professionals welcome the promise of standardisation under ISO 14000, particularly its potential to bring more consistency and stability to some of the nonquantitative and unregulated aspects of the environmental field (Apsan, 1995). According to Zuckerman (1996), the series will:

- provide a platform for companies to demonstrate commitment to environmental protection
- offer a means for them to improve their environmental management
- provide a worldwide focus on environmental management
- promote voluntary consensus standards for environmental matters
- harmonise national environmental rules, labels, and methods
- promote environmental predictability and consistency
- minimise environmental trade barriers.

Details of progress on the standards in the ISO 14000 series are summarised in Appendix A. Process and organisational issues addressed by the standards include:

- Environmental Management Systems (EMS), which includes
  - the ISO 14001 standard to which companies will register, and
  - ISO 14004, the guidance standard that explains EMS and helps companies to tailor it to their operations
- Auditing, which directs internal and third-party auditors who conduct EMS audits and defines auditor qualifications, and
- Performance Evaluation, which specifies methods companies should use to collect, analyse and report environmental performance data.

Product-oriented standards in the series include:

- Life Cycle Assessment, which specifies how the impact of a product or process should be evaluated from raw material through to final disposal
- Labelling, a global guide to terms and practices for environmental claims on labels, and
- Product Standard, a guide to organisations that write product standard provisions.

3.2 Development of environmental management systems standards

The British Standard, BS7750, was the first environmental management system (EMS) standard. It was originally published in 1992. It achieved far-reaching recognition with companies seeking certification world-wide. Following its publication, national EMS standards were also developed in Ireland (I.S. 310), Spain, France, Israel and Australia. The EU Regulation - the Eco-Management and Audit Scheme (EMAS) - came into operation in 1995. In view of the number of EMS standards and the level of interest shown, the International Organisation for Standardisation issued ISO 14001 in an attempt to achieve harmonisation, and in order to avoid potential conflicts and trade barriers. Following the arrival of ISO 14001 in October 1996, all other national EMS standards such as BS 7750 and I.S. 310 were withdrawn in March 1997. An organisation may now seek certification to ISO 14001 or verification to EMAS. While the EMAS regulation is recognised as being more demanding than ISO 14001 (ENDS Report 271, 1997), the European Commission has now formally recognised ISO 14001/EN ISO 14001 and its certification procedures, as fulfilling many of the EMS

requirements of the Regulation (Department of the Environment and Local Government, 1997).

3.3 Why an organisation should implement a formal environmental management system

The purpose of implementing a formal environmental management system is to ensure that environmental factors are considered by design rather than by accident. Moxen and Strachan (1995) describe the aim of environmental management standards as being to define and assemble the components of a management system that can perform two essential functions as regards the capacity of the firm to control and diminish the impact that its operations, goods and services have on the environment. The first function of this system is to make it possible for the firm to set environmental standards, monitor performance in the light of these and take corrective action as necessary. The second function is to support the development of a climate of reflection, constructive criticism and innovative thinking about environmental issues and problems which enables the firm to continually revise the quality of its activities and to set higher standards. The system should address the twin concerns of quality assurance and organisation learning as these relate to the firm's ability to manage its relationship with the environment more effectively.

A recent survey of European companies concluded that external concerns, such as compliance with legislation, are the key drivers in persuading corporations to implement a formal environmental management system (Stuart, 1997). Operational improvements were viewed as a purely secondary concern, and the desire to satisfy other stakeholders, such as shareholders, the

local community, financiers and pressure groups was considered least important. The survey revealed different priorities, however, about the major benefits of going through the EMS process. While legislative compliance was still important, internal considerations such as improved staff awareness of environmental management and improved working conditions were considered major benefits.

There has been some debate about the limitations of ISO 14001. Gleckman and Krut (1996) argue that meeting the requirements of such a standard is not essential to having a strong EMS. They fear that industry leaders who have been experimenting with innovative ways to create global environmental performance standards without sacrificing local autonomy or corporate competitiveness, will effectively be discouraged because gaining ISO 14001 will grant companies an '***easy A***' even if they have low environmental performance standards.

It must be stressed, however, that ISO 14001 is a management standard only, and does not set environmental performance standards that reflect a company's compliance. As Beedie (1996) points out, ISO 9001 (quality management system standard) does not ensure good quality (a company could happily produce cracked cups if this is the intention of its policy, plans and procedures). Similarly, ISO 14001 does not ensure good environmental performance. It does, however, go beyond ISO 9001, by requiring a commitment to continual improvement to overall environmental performance from the company.

ISO 14001 does provide an ideal chance to make real improvements in company environmental performance. For companies who are currently doing nothing on the environmental front, it provides a useful management model. For those already taking action, it provides a useful benchmark (Sunderland, 1996). While it is a voluntary standard, its uptake should mirror that of ISO 9001 and 9002, with customers preferring to use accredited suppliers (Struebing, 1996).

3.4 ISO 14001 requirements

The elements of the EMS specified in ISO 14001 are outlined in Figure 3-A.:

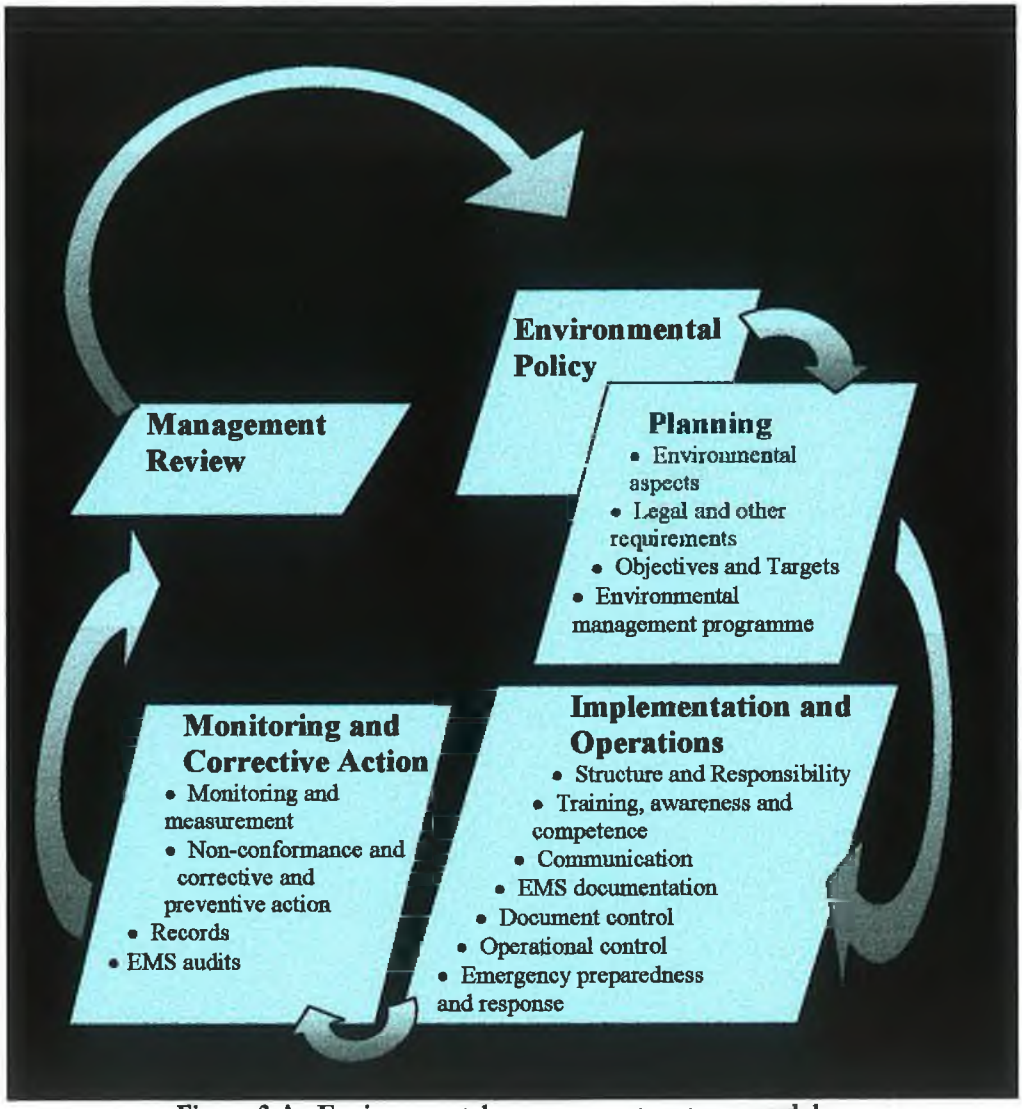

Figure 3-A: Environmental management systems model
[Source: *adapted from* ISO 14001: 1996(E)]

3.4.1 Initial review

Although not specifically defined as a part of the standard, an initial review is recommended to establish an organisation's position with regards to the environment. It should cover legislative and regulatory requirements; an identification of significant environmental aspects; an examination of all existing environmental management practices and procedures; and an evaluation of feedback from the investigation of previous incidents.

3.4.2 Environmental policy

The next step is to draw up an environmental policy which sets the framework and guiding principles for action for the organisation. All other elements of an EMS flow from this. As the business world is now strongly advocating self-regulation instead of command-and-control regulation, Ketola (1997) argues that, in this climate, an environmental policy will become morally binding on a company. Non-compliance with the policy will be noted and protested against by external interest groups.

3.4.3 Planning

In order to meet the environmental policy, a plan covering the following areas must be prepared:

- Environmental aspects and impacts
- Legal and other requirements
- Objectives and targets
- Environmental management programmes.

3.4.4 Implementation and operation

The EMS model basically follows the 'Plan-Do-Check-Act' cycle, made famous by Deming. Once the planning phase has been completed, the "Do" phase involved assigning responsibilities; training and awareness; communication; documentation; operational control; and emergency preparedness.

3.4.5 Checking and corrective action

The "Check-Act" phases involve monitoring and measurement; non-conformance and corrective and preventive action; auditing; and record maintenance.

3.4.6 Management review

This requires management to periodically review the EMS to ensure its continuing suitability, adequacy and effectiveness.

3.5 EMAS

The EU regulation for a voluntary Eco-Management and Audit Scheme (EMAS) (1863/93) was adopted on June 29, 1993. It became applicable from April 1995 following the establishment of the required competent bodies in the member states.

The regulation has three objectives:

- to encourage the establishment of corporate environmental policies which include commitments to continuous improvement in environmental performance
- to encourage companies to provide information about the measures which they are introducing, in the form of verified public statements, and
- to encourage overall consistency of approach in
  (a) the conduct of eco-audits, and
  (b) the development and use of environmental management systems.

The regulation is voluntary and applies to specific industrial sites. Table 3-I describes the stages a company must undertake to achieve registration to EMAS.

1. Adopt a company environmental policy
2. Undertake an environmental review
3. Establish environmental programmes
4. Install an environmental management system
5. Undergo an environmental audit
6. Prepare an environmental statement
7. Seek verification

Table 3-I: Stages in the Eco-Management and Audit Scheme

(Source: European Commission, 1993)

The stages of compliance with EMAS are similar to those of ISO 14001, with the major difference being the addition of a requirement to publish an independently verified environmental statement. The EU Regulation specifies information which must be included in the statement (see Table 3-II).

The statement shall include:

- a description of the company's activities on the site
- an assessment of all significant and relevant environmental issues
- a summary of figures for material and energy consumption and waste generation and other significant environmental aspects
- other factors regarding environmental performance
- details of the company's environmental policy, programmes and management systems at the site concerned
- any changes in environmental performance since the last statement
- the deadline for the next statement
- the name of the environmental verifier.

Table 3-II: Coverage of the environmental statement

(Source: European Commission, 1993)

The Eco-Management and Audit Scheme was designed to bring more industrial environmental performance data into the public domain. In the opinion of many, including certifiers interviewed by IEM (1996), the EMAS scheme is setting the standard in recognised environmental management systems, in that reporting to stakeholders can only increase in importance in the future.

3.6 Conversion from ISO 14001 to EMAS

A guidance document has been produced by the European Commission for use when a site to be verified to EMAS already has an ISO 14001 certificate. Table 3 – III outlines the areas a verifier must check if this is the case.

- Confirm that the certificate is issued under an approved accreditation scheme Check that the scope of the certificate covers the same geographic area as the scope for the EMAS registration
- Ensure that the implementation of ISO 14001/EN ISO 14001 has covered all items listed in Annex I C and D of the Regulation
- Check that the environmental aspects and significant environmental impacts identified by the site address the effects listed in Annex I B3, where appropriate
- Confirm that the site has made provision for legal compliance
- Check that the frequency of the audit cycle is three years or less and that the audit addresses environmental performance, and
- Ensure that the data in the environmental statement are a fair representation of the site's performance and that the statement meets the requirements of Article 5 of the Regulation.

Table 3-III: Conversion from ISO 14001 to EMAS
(Source: Department of the Environment and Local Government, 1997)

EMAS is due for revision in 1998. This will facilitate its expansion into more non-EU countries. The Scheme is already being introduced into Poland, Iceland, Hungary and the Czech Republic.

3.7 Achieving formal recognition of an EMS

In principle and in practice, both EMAS and ISO 14001 involve external auditing by independent third party auditors. There is general agreement that the credibility of EMS certification will depend largely on the quality of external auditing, i.e. for certification or verification (Houldin, 1997). As business becomes more international, the consistency of auditing is crucial. The legislation which established EMAS obliged Member States to ensure consistent application of its provisions, and most of them have adopted similar approaches in the procedures for accreditation of verifiers and the verification process itself (ENDS Report 255, 1996). The fact that Germany has approximately 75% of EMAS registrations in Europe has fuelled criticism of its accreditation system (ENDS Report 255, Holmes, 1997).

Provided the credibility of the accreditation process is maintained, certification can provide a mechanism through which good corporate citizenship can be demonstrated. National governments may require certification as a condition of contract. Companies with major export markets may benefit from certification to an internationally recognised standard, (or to the European scheme). Certification could improve relations between industry and the regulators. The insurance industry is beginning to recognise the value of environmental management systems in controlling liability (Sunderland, 1996). For those people implementing an EMS in their organisation, certification can provide a valuable incentive for operational staff. The impending visit of an external auditor tends to push the EMS up the priority list and provides a spur to action throughout the organisation.

Certification will add additional operating costs. These may well be offset by savings accrued through better environmental management. Overall, the advantages of certification far outweigh the limitations. The certification procedure of regular follow-up audits forces companies to take action, thus negating the likelihood of environmental issues being shelved. By achieving certification, a company has publicly announced its environmental commitment. The negative press it will receive if this certification is withdrawn, or if the company is prosecuted for pollution offences, will be much greater, and companies will try to avoid this at all costs.

3.8 Management systems integration

An integrated approach to management standards, combining quality assurance and environment, health and safety would be preferable to most companies (Stuart, 1997, Beedie, 1996, Beechner and Koch, 1997). However, individual standards have been developed for different purposes, and it is therefore left to companies to try to unify their management systems. According to Tranmer (1996), the objectives of integrated management systems are:

- to improve understanding and use of the systems by everyone in the organisation
- to reduce the administrative burden of managing separate management systems, and
- to align the management systems with the strategic directions of the organisation, rather than each of the separate systems pulling in different directions.

Practical guidance as to how the documentation and record requirements of ISO 14001 can be successfully 'bolted on' to an existing ISO 9001 system is summarised in Table 3-V.

While ISO has shelved the idea of creating voluntary standards for occupational health and safety (Thayer, 1996), the British Standards Institute (BSI) has published BS 8800, an Occupational Health and Safety (OHS) Standard, and in Ireland, the National Standards Authority of Ireland (NSAI) has developed a draft OHS standard. These standards are purely guidance documents, and are not intended as a basis for certification. The emergence of these Health and Safety standards reflect the continuing shift away from a prescriptive approach, which relied on expert personnel, to a participative approach relying on good management processes, with the accent on continuous improvement (Smith[2], 1996, Jarvis, 1997). QMS and EMS standards share this approach, and so share many common elements which can be integrated.

ISO 14001 clause	Documentation requirement	Comments	Record requirements (minimum required)
4.1	Policy	Include environmental policy with existing quality policy. This will provide an operating policy	
4.2.1	A procedure for identifying those environmental aspects that the organisation can control	A new procedure is required	
4.2.2	A procedure to identify and have access to legal and other requirements	A new procedure is required	Legal and other requirements directly applicable to the environmental aspects of activities, products, or services
4.2.3	Environmental objectives and targets	Add to the existing organisational objectives and targets	
4.4.1	Roles, responsibility and authority	These should already be defined in existing organisational charts and job descriptions	
4.4.2	Procedure for environmental training needs	Add to existing ISO 9001 training procedure. (Provide work instructions for evaluating environmental training needs)	Training records
4.4.3			Decisions on external communications on significant environmental aspects
4.4.5	Document control procedure	Add to existing ISO 9001 document control procedure	
4.4.6(a) and 4.4.6(b)	Operational control	Add to existing operator instructions	
4.4.6(c)	Procedure for the identifiable significant environmental aspects of goods and services used by the organisation and for notifying suppliers of the requirements	A new procedure is required	
4.4.7	Procedure for emergency preparedness and response	A new procedure is required	
4.4.1	Procedure for monitoring key characteristics	Add to existing inspection and testing procedure. (Provide work instructions for specific operations)	Information to track performance
4.4.1	Procedure for calibration	Add to existing calibration procedure	Calibration records
4.4.1	Procedure for evaluating compliance with relevant environmental regulations	A new procedure is required	
4.4.2	Procedure for non-conformance	Add to existing non-conformance procedure. (Provide work instructions if specifics are required)	
4.4.3	Procedure for identifying, maintaining, and dispositioning records	Add to existing records control procedure	
4.4.4	Procedure for internal audits	Add to existing internal audit procedure	Internal audit results
4.5			Management review minutes

Table 3-III: Documentation and record requirements for integrating ISO 14001 with ISO 9001

(Source: Beechner and Koch, 1997)

3.9 Threats to environmental management initiatives

Shelton and Shopley (1996) outline the following key factors which can threaten the success of strategic environmental management programmes, such as implementing ISO 14001:

- Corporate downsizing, which often throws environmental programmes into tailspins
- Tight financial controls and increased scrutiny of the bottom-line contribution of all organisations in the company
- New management paradigms, (e.g. re-engineering, total quality management) that redirect management priorities
- Overly aggressive cheerleading for potential benefits from strategic environmental management, thereby raising false expectations
- Creation of an environmental culture incongruent with the business culture of the company
- Poor communication between the environmental organisation and other parts of the business about potential competitive advantage.

Companies are hitting a 'green wall' by neglecting to integrate environmental knowledge into their management decisions. Hitting the "green wall" occurs when environmental efforts are not embraced by other sectors in the company. The terminology, acronyms, and nontangible aspects of the environmental arena make it foreign to other areas that rely on quantitative figures and accurate facts to operate. The green wall can be successfully overcome by aligning the environmental vision with the company's business

goals, communicating EMS benefits, subjecting the EMS to appropriate measurement and financial scrutiny, and carefully managing the transition.

3.10 Conclusion

Despite some criticisms of ISO's role in developing the ISO 14000 series of standards, the fact that they've done so has placed environmental issues firmly on the business agenda worldwide, thanks to the international recognition of ISO. While it is important that organisations recognise the limitations of the standards, and of the certification process, they should not use these as an excuse for doing nothing. The EMS should be integrated with other management systems, and environmental issues made a fully fledged part of the company's overall business management approach.

Companies should consider implementing ISO 14001 as a first step, and then, as their system matures and environmental knowledge increases, they may utilise the other standards in the ISO 14000 series to produce an environmental report, seek an eco-label for their product, or carry out a life-cycle analysis (LCA). EMAS is being seen as a natural progression from ISO 14001. Its role in Europe cannot be underestimated. If implementing an EMS is considered to be the first step to 'greening' the organisation, publishing an environmental statement will surely become the second step.

Chapter Four

Environmental Aspects and Impacts

4.0 Introduction

This chapter describes in detail one of the key areas involved in implementing a formal environmental management system – the identification of an organisation's significant environmental aspects and impacts. Certifiers agree that this causes the greatest amount of confusion to people implementing an EMS. As the EMS hangs on this identification, and it is a new area to those who have experience in implementing quality management systems, it warrants detailed examination.

4.1 Definition of aspects and impacts

The objective of any EMS should be to continually improve an organisation's environmental performance and a prerequisite for this is a sound knowledge of the environmental impacts which stem from an organisation's activities. Clause 4.3.1 of ISO 14001 requires organisations to identify the

"environmental aspects of its activities, products or services that it can control and over which it can be expected to have an influence, in order to determine those which have or can have significant impacts on the environment."

Environmental aspect:

"any element of an organisation's activities, products or services that can interact with the environment."

Environmental impact:

"any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's activities, products or services."

The term environmental '**effect**' used in BS 7750 (and also in EMAS) has been transformed to 'aspects' and 'impacts' in ISO14001. Under BS7750 (1994) the term effect, defined as

"any direct or indirect impingement of the activities, products and services of the organisation upon the environment, whether adverse or beneficial,"

is broadly analogous to impact. This definition was often a source of confusion, however, with many managers blurring the difference between aspects and impacts thereby failing to properly define the impact of their organisation's activities. In many ways ISO 14001 clarified the situation by introducing the concept of an aspect **between** an activity and an impact (IEM, 1996). Figure 4-A gives a graphic illustration of the differences between aspects and impacts arising from an activity.

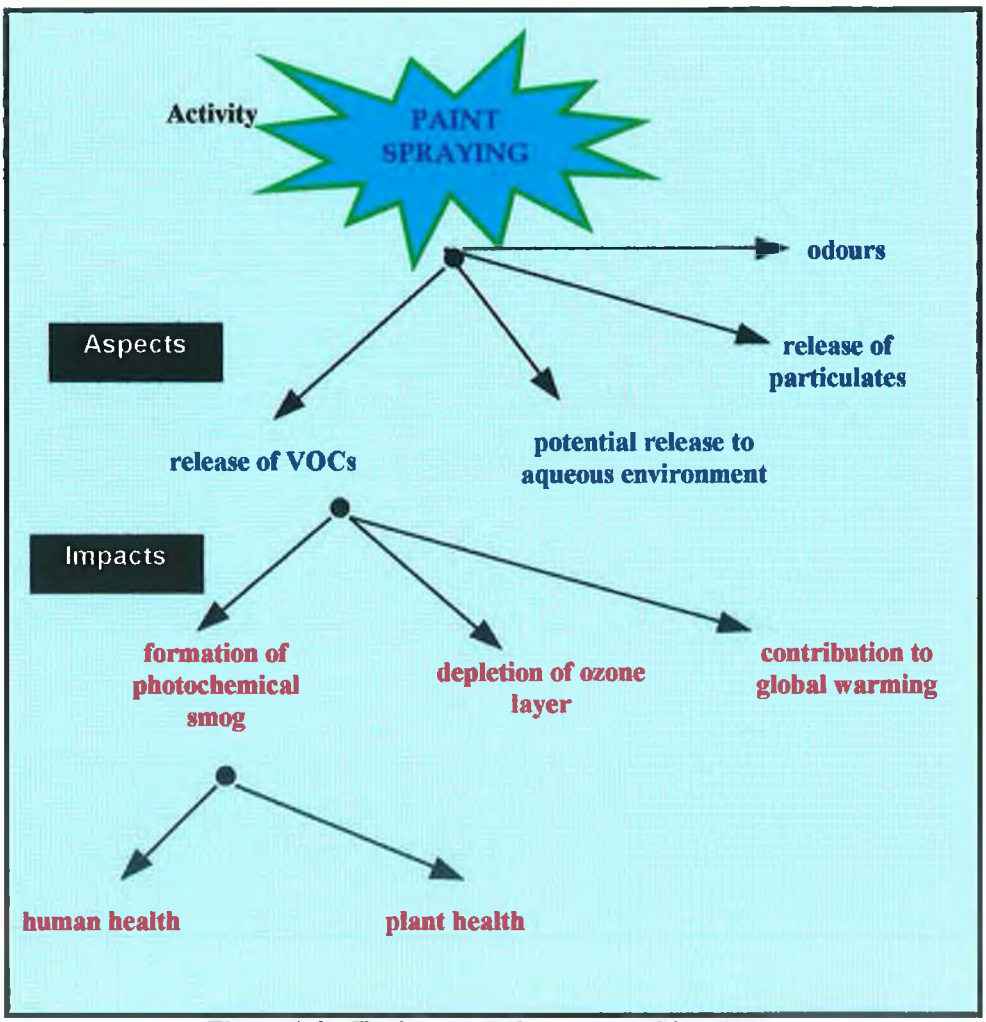

Figure 4-A: Environmental aspects and impacts
(Source: IEM, 1996)

4.2 Control and influence

Once significant aspects and impacts have been identified, the organisation must then decide if it can be expected to have influence over an aspect. This can be a difficult issue. ISO 14001 effectively gives the organisation leeway in drawing the boundaries of the system. In making this decision, managers will need to ask themselves what the system is for. A compliance-based system will tend to focus on ability to control in deciding what is or is not significant, and will focus on the direct impacts associated with the organisation's own activities, products and services. A system with a more strategic role will look at a broader set of aspects and influences. Figure 4-B outlines a model for determining influence.

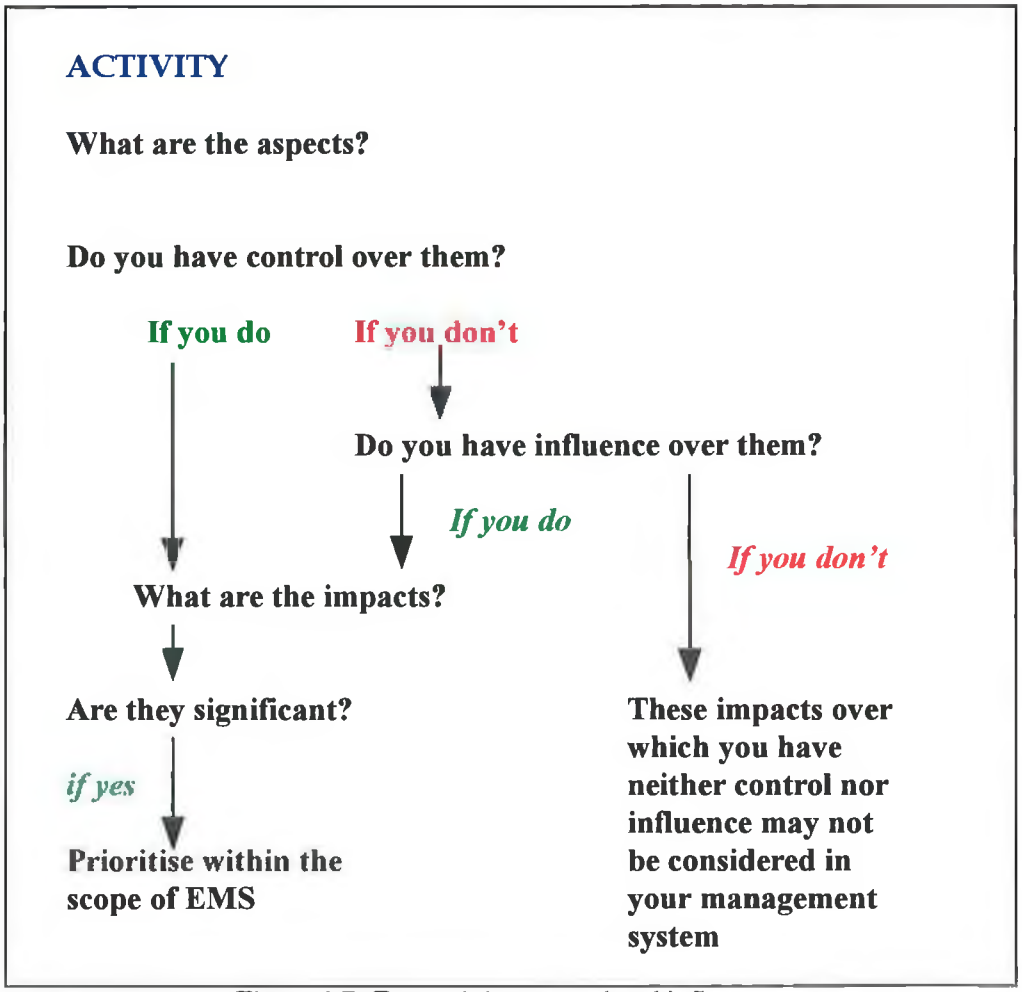

Figure 4-B: Determining control and influence
(Source: IEM, 1996)

4.3 Determining significance

Powley (1996) made the following points in regard to determining the significance of environmental effects in relation to BS7750. These points remain relevant in determining significance of environmental aspects and impacts:

- The decision as to whether an effect is significant lies solely with the operator of the EMS
- The process (of determining significance) needs to have a strong rational associated with it, which uses the same decision-making criteria in a consistent way
- The decision making criteria may include legislative control, community sensitivity, employee sensitivity, political sensitivity, toxicity, eco-toxicity, local circumstances of environmental concern or protection, and many other factors
- The concept of significance is relative, according to the situation, e.g. the environmental effects associated with the use of 50 company cars, such as vehicle emissions, may assume more significance to an accountancy firm than to a power station.

Typically the impact will be significant if it is controlled by legislation, has a financial implication, has (or has potential to cause) a demonstrable environmental impact, is of concern to customers, is of concern to financiers or insurers, or is of concern to the local community.

Some companies employ a risk assessment methodology to evaluate significance. IEM cautions that there is no perfect "off-the-shelf" score-

based risk assessment methodology that will result in an indisputable priorities list of significant impacts. The simplest approaches are often best. Companies that use risk assessment methodologies most successfully are those that use them as a guide based on assessment criteria suited to their own organisations. Established techniques such as Failure Mode and Effects Analysis (FMEA) can be adapted for this process.

4.4 Conclusion

The identification of the organisation's significant aspects and impacts is crucial to the development of the EMS. While it is impossible to cover every possible scenario of events, it is important that a strong methodology is established for carrying out the process. The identification process is never complete, it needs to be revisited every time the organisation changes its activities, products or services. However, once a solid, repeatable methodology has been established, this process should become easier with time.

Section II

PRIMARY RESEARCH

Implementing ISO 14001 in a Software Company

Chapter Five

Introduction and Background

5.0 Introduction

Primary research into the implementation of an Environmental Management System was carried out in Software Co.* during the course of research for this thesis. The author played a key role in the design and implementation of the EMS, and this section describes this work, particularly in the following areas:

- **Legal and other requirements:-** reviewing the legislation pertinent to Software Co. and compiling a Register of Regulations, maintaining and updating this over the duration of the project
- **Environmental Aspects and Impacts:-** updating the Environmental Aspects/Impacts Evaluation, and defining a methodology for this
- **Objectives and Targets, and Environmental Management Programmes:-** setting up and co-ordinating the Environmental Management Programmes to meet the company's environmental objectives and targets, chairing monthly Environmental Management Team meetings to monitor progress towards achieving the objectives and targets
- **Internal Environmental Audits:-** carrying out monthly environmental audits in Software Co. and reporting these to Senior Management
- **Document Control System:-** integration with the existing document control system
- **The Assessment Process:-** ensuring all applicable procedures and instructions were in place for compliance with the requirements of ISO

* The software company requested that their name remains confidential, so they are referred to as Software Co. for the purposes of this thesis.

14001, going through the certification process including the Main Assessment, where the company were recommended for certification to ISO 14001.

5.1 Preliminary research at undergraduate level

Software Co. first decided to implement an environmental management system in the Summer of 1994, when the British Standard for Environmental Management Systems (BS 7750:1994) was republished. This decision was prompted by another software company becoming one of the first Irish companies to attain EMS certification. Software Co. had achieved ISO 9002 certification in 1991, which was relatively late in QMS terms, and sought to become an early mover in EMS implementation. The project was proposed by the Quality Supervisor in April 1994 for the reasons outlined in figure 5-A.

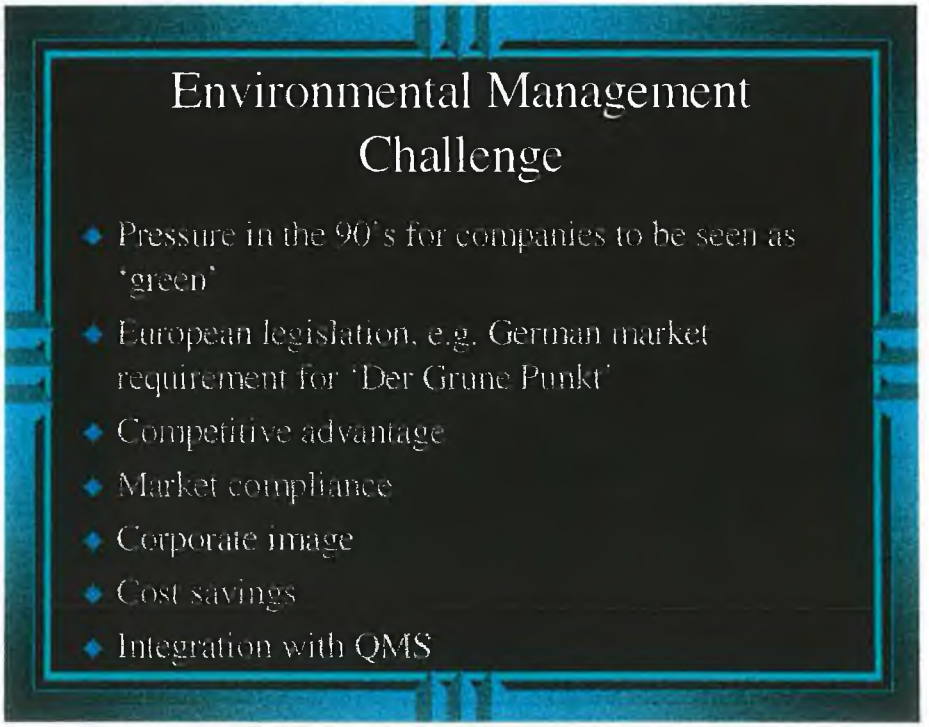

Figure 5-A: Highlights from EMS presentation to management.

The project was approved by senior management and a consultant was hired initially. Preliminary work was undertaken in-house by the author as part of an undergraduate work placement in conjunction with the Quality Supervisor in June 1994. Table 5-I shows the main areas covered by the undergraduate in her BSc final year project.**

Undergraduate project
Literature review ➢ Outlined the global environmental issues and examined how industry contributes to these ➢ Highlighted some of the pressures being exerted on industry, and examined the various strategic options available to businesses ➢ Described the individual elements of an environmental management system, BS 7750, and reviewed the key steps to implementation, such as commitment, the preparatory environmental review, policy, operational control, auditing and continuous improvement ➢ Discussed life cycle assessment (LCA) and the key issues arising from an evaluation of a software company's environmental effects, such as waste, paper and printed matter, recycling, energy use, ozone depleting substances, transport. **Practical work:** ➢ Visited three BS 7750 certified companies ➢ Carried out a Preliminary Environmental Review, which involved the examination and evaluation of environmental effects arising from the activities of the software manufacturing company ➢ Drew up an Environmental Policy for the software manufacturing company.

Table 5-I: Undergraduate project work

** *When the project was first undertaken in 1994, the EMS was developed to comply with the requirements of the British standard, BS7750. At that time it was assumed that ISO would develop an international standard for Environmental Management Systems based on the British Standard, in the same way that the QMS standard, ISO 9001 had its origins in BS 5750. When ISO 14001 was subsequently published in 1996, only relatively minor changes were then required to bring Software Co.'s EMS into compliance with this. This conversion was undertaken by the author during 1996/1997.*

On completion of the author's work placement in January 1995, a new employee in the QA department took over the EMS responsibilities. Subsequently other projects took priority and the EMS project did not develop any further at that time.

In November 1995, the author proposed to complete the implementation of the EMS in the software company as a case study for her postgraduate thesis.

5.2 The company

Software Co. (Ireland) is part of a leading multinational software company. It employs approximately 500 people and is responsible for the manufacture and distribution of Software Corporation's products throughout Europe.

The nature of the software industry is such that, with the release of new products every six months or so, an organisation must be capable of rapid development and response in order to stay ahead of its competitors. As a leader in its field, Software Co. is constantly evolving and changing, employing the latest technology and management techniques in its never-ending quest for continuous improvement.

World Class Manufacturing (WCM) techniques have been followed in Manufacturing in Software Co. since 1991 (see figure 5-B). These techniques focus on:

- the elimination of waste through just-in-time (JIT) activities
- customer satisfaction through emphasis on failsafing processes to make it impossible for errors to occur in the first place
- Total Quality in every aspect of the organisation, and
- employee involvement through working in teams and communicating swiftly and effectively using the latest communication tools in rapid response to ever-changing situations.

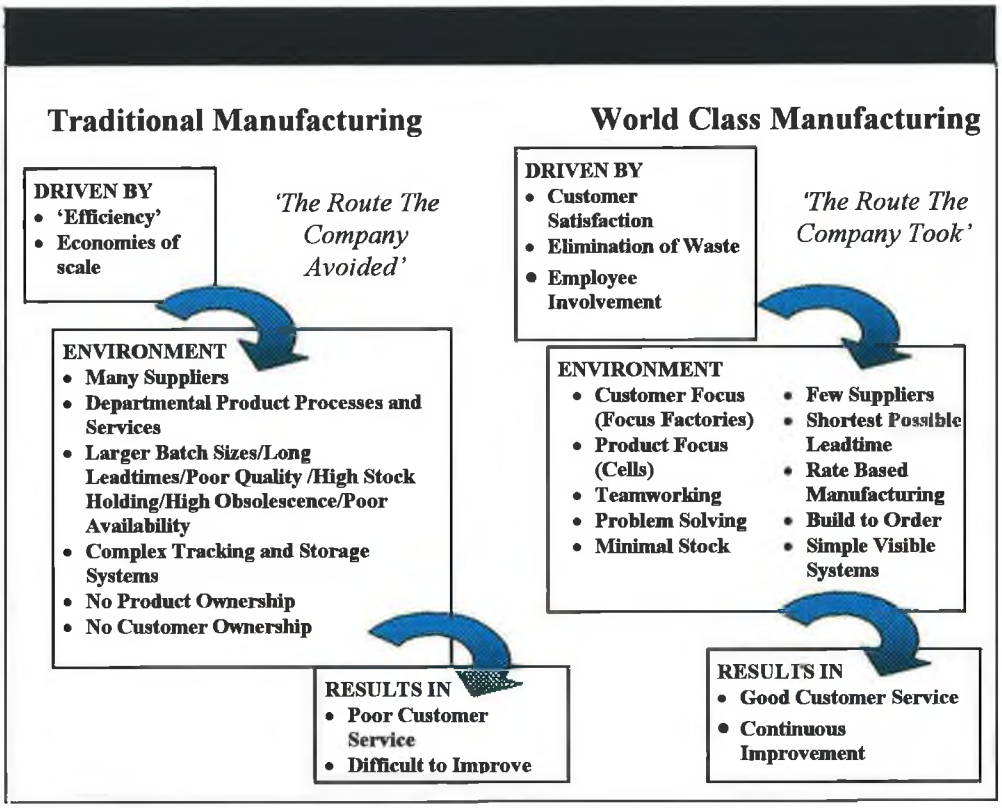

Figure 5-B: A rapid response plant in Ireland applying World Class Principles (Source: Collins & Reynolds, 1995)

From an environmental viewpoint, Software Co. would be considered a 'clean' industry, and by its very nature, its product enhances people's ability to work more efficiently and productively by fostering the electronic exchange of information.

The activities on the Software Co. site are classed as 'software development', so that the only permits required are for external works and car parks. There are no requirements from the local authority regarding licences, as the nature of the activities carried out on the site do not produce any significant discharges to drains or emissions to the atmosphere, as illustrated in figure 5-C.

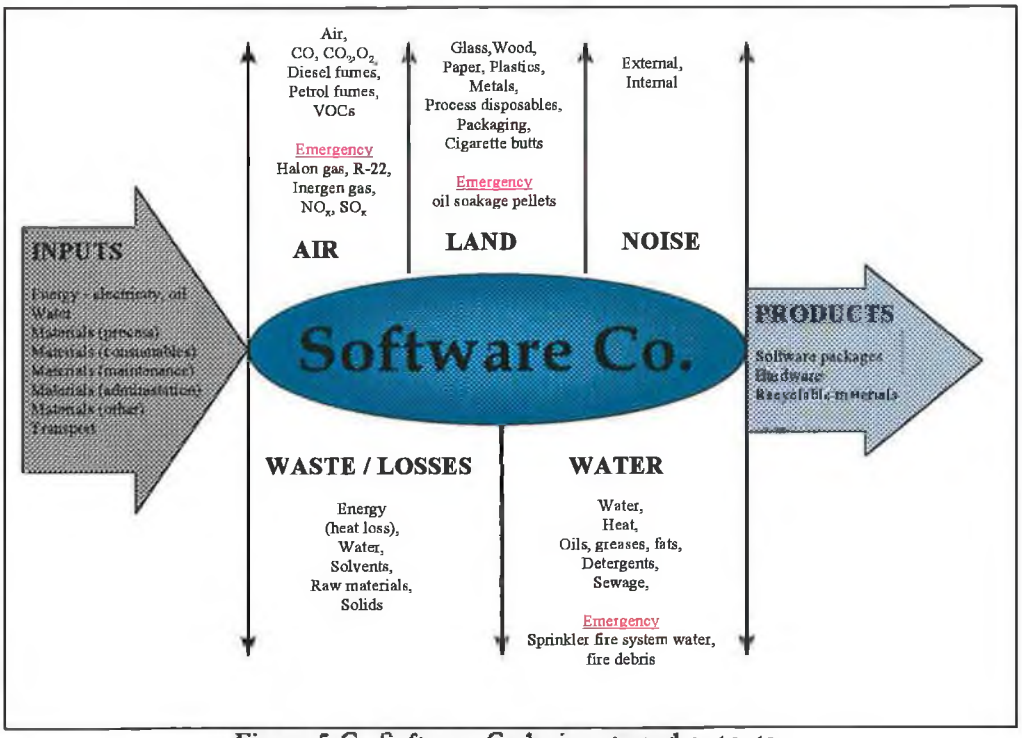

Figure 5-C: Software Co.'s inputs and outputs.

Software products are made up of diskettes or compact discs (CDs), manuals and leaflets packed into cartons. The main raw materials are paper, board and plastic. The greatest volume of waste arising from manufacturing is cardboard, which is fully recyclable. Other wastes generated are paper, plastic - mainly shrink-wrap, small quantities of metals, wood, etc.

In the manufacturing process, JIT operates where product is manufactured directly to customers' orders. Vendors deliver only the required quantities of materials directly to the point of assembly on returnable trolleys just-in-time for use. Product is shipped very rapidly and warehousing has practically been eliminated from Software Co.. The result is virtually 'waste-free' processes, with no holding of stocks or raw materials.

5.3 Conclusion

While many proactive and environmentally 'positive' practices were already operating in Software Co., implementing a formal EMS would substantiate the company's image as an environmentally friendly company. An EMS focuses attention on areas that may not have been considered important to the company in the past, but which may provide new opportunities for environmental (and often financial) gain. Implementing an EMS in Software Co. provided opportunities for:

- taking a proactive approach to impending legislation, both national and international, particularly in the area of packaging
- monitoring and generating awareness of energy usage on-site
- quantifying waste and identifying opportunities for its reduction, reuse and recycling
- co-ordinating and promoting awareness of environmental initiatives cross-functionally
- providing customers with prompt environmental feedback, and
- encouraging suppliers to adopt environmental policies of their own.

Chapter Six

Legal and Other Requirements

6.0 Introduction

ISO 14001 requires the organisation to establish a procedure for identifying and having access to legal and other requirements that are applicable to its environmental aspects. During the Preliminary Environmental Review, the consultant had provided binders containing relevant environmental legislation. Just having copies of the applicable legislation on file, however, was not sufficient to demonstrate awareness of legal requirements. The task was to interpret this legislation and to gain an understanding of how it applied directly to Software Co.

6.1 Researching the legal requirements

One approach considered was to read through each Act or Regulation and try to elicit pertinent clauses and summarise how these applied directly to Software Co. This was discarded as being too onerous, and daunting to somebody without a legal background. The route the author took was formal study of the material outlined in Table 6-I.

Environmental Legislation and Environmental Management modules from the final year in Sligo RTC's BSc (Environmental Science and Technology) were studied as foundation subjects: ♦ The 30 hour Environmental Legislation module addressed the nature of law, EC, International and Irish environmental protection and control legislation. ♦ The 60 hour Environmental Management module included the areas of the Planning Process and Environmental Impact Assessments (EIA) and Statements (EIS). A 5-day Environmental Auditor Training Course was also undertaken by the author, during which environmental legislation was covered briefly, but informatively

Table 6-I: Course of study pursued by author in legislative area

In addition to gaining an understanding of particular pieces of legislation, it then became easier to identify and interpret other legislation as much of it is framed in a similar manner.

6.2 Compiling the register

Sources consulted included the Government Publications Office, the Environment Bulletin published by the Department of the Environment and Local Government, ENFO, Software Corporation's European Headquarters, industry journals and reports. Legislation such as EU Council Directives, Regulations, Decisions and Irish Statutory Instruments were reviewed and entered into a Register of Regulations. Other requirements considered included Codes of Practice for Fire Systems and Emergency Lighting, Hot Work Permits required by Facilities from contractors performing hot work on-site, and the parent company's Corporate Commitment to the Environment, whose pledge 'to conserve, reuse and recycle' was embodied in Software Co.'s Environmental Policy.

The main pieces of legislation identified and entered onto the Register of Regulations are listed in Table 6-II.

Register of Regulations	
Water	➢ Local Government (Water Pollution) Act, 1997 (S.I. No. 1 of 1977) ➢ Local Government (Water Pollution) (Amendment) Act, 1990 (S.I. No. 21 of 1990)
Air	➢ The Environmental Protection Agency Act, 1992 (S.I. No. 7 of 1992) ➢ Air Pollution Act, 1987 (S.I. No. 6 of 1987)
Waste & Packaging	➢ European Communities (Toxic and Dangerous Waste) Regulations, 1982 as amended (S.I. No. 33 of 1982) ➢ European Communities (Waste) Regulations, 1979 (S.I. No. 390 of 1979) ➢ EU Directive on Packaging and Packaging Waste (94/62/EC) ➢ Waste Management Act, 1996 (S.I. No. 10 of 1996) ➢ Draft Waste Management (Packaging) Regulations, 1997
Building	➢ Local Government (Planning and Development) Acts, 1963 to 1993 ➢ Local Government (Planning and Development) Regulations, 1994 (S.I. No. 86 of 1994) ➢ Building Control Act, 1990 and regulations made thereunder
Safety	➢ Safety, Health and Welfare at Work Act, 1989 (S.I. No.7 of 1989) ➢ Safety, Health and Welfare at Work (General Application) Regulations, 1993 (S.I. No. 44 of 1993)
Noise	➢ Environmental Protection Agency Act, 1992 (Noise) Regulations, 1994 (S.I. No. 179 of 1994)
Ozone Depleting Substances	➢ Council Regulation (EC) No. 594/91 of 4 March, 1991 which implements the Montreal Protocol on Substances that Deplete the Ozone Layer
Litter	➢ Litter Pollution Act, 1997 (S.I. No. 12 of 1997)

Table 6-II: Main pieces of legislation identified in the Register of Regulations

The Register gives a brief description of each of the pieces of legislation, and then describes its direct implications to Software Co. The key impact area (of responsibility) is identified and if a licence or permit is required, this is identified under 'Audit requirements'. An example of this is given in Table 6-III. The complete Register of Regulations compiled by the author is set out in Appendix II.

Water
➢ Local Government (Water Pollution) Act, 1997 (S.I. No. 1 of 1977) ➢ Local Government (Water Pollution) (Amendment) Act, 1990 (S.I. No. 21 of 1990) **Description** These Acts include a general prohibition on causing water pollution, provisions concerning licensing of discharges to waters and to sewers, water quality standards, water quality management plans, civil liability of polluters. **Impact area** Suppliers; Contractors; Facilities
Direct implications for Software Co. None of the activities of Software Co. require licensing or discharge consents, so the direct implications to the Software Co. site are that it is an offence to cause or permit any "polluting matter" to enter "waters" as defined in the Act. This may be particularly pertinent when contractors are on-site carrying out building work. **Audit requirements** Suppliers discharging to drains may require either a licence from their local authority or an IPC licence.

Table 6-III: Example from Register of Regulations

6.3 Maintenance of the Register

The author drew up a procedure for the maintenance of the Register of Regulations, describing who was responsible for its upkeep, how often it would be reviewed, how the document would be controlled and updated, and how it could be accessed.

Overall responsibility for the Register lies with the nominated Environment Manager. This is the manager who, irrespective of other responsibilities, has overall responsibility for ensuring that the EMS is maintained.

Responsibility for ongoing maintenance of the Register was designated to the author during the implementation period. This was done by reviewing relevant manuals, such as the Environment Bulletin, the ENDS Report,

European Packaging and Waste Law, etc. Because Software Co. distributed its products throughout Europe, Africa, the Mediterranean and the Middle East, it was important to be aware of any legislation developing overseas which might have a potential impact for the company.

The Register of Regulations is a write-protected document which is available to all PC users for reference on the Quality Document Control System. If a new piece of legislation or a change to existing legislation has direct implications for Software Co., it is then entered onto the Register of Regulations upon submission of a Change Request as per Document Control procedures. The Environmental Manager would then have to approve any changes to the Register.

New developments in legislation and policy areas are communicated to appropriate persons, either through the monthly Environmental Management Team meetings, the Engineering Process meetings or other means deemed appropriate.

6.4 Compliance with legal requirements

Once particular legislative requirements have been identified, the onus is then on the company to ensure they are in compliance with these. This was achieved in Software Co. through the mechanism of the internal environmental audit. Part of the audit protocol involved identifying any applicable legislative requirements which might relate to the area being audited. During the course of the audit, the auditor would then check that

there was awareness of, and compliance with, the legal requirements. To aid an auditor, licensing requirements were identified in the Register itself.

6.5 Conclusion

Becoming familiar with the legal requirements relating to the environmental aspects of a company's activities, products or services initially seems to be a laborious and complex element of the EMS, and is breaking new ground for quality practitioners. The initial learning curve is steep, and it is very useful to receive some formal training at this stage. Some 200 pieces of environmental legislation have originated from the EU, so it is important to establish the main Acts and Regulations that are relevant to the organisation. The Register should demonstrate quality rather than quantity, that is, a level of understanding and awareness as to what the legal requirements are and how they apply directly to the company, rather than a lengthy list of every piece of environmental legislation published. Once the Register has been established, and an awareness of the pertinent legislation raised, its upkeep is then not particularly difficult. The legislative process is fairly slow, and by keeping an eye on industry journals, one can watch impending legislation develop, and prepare accordingly.

Chapter Seven

Environmental Aspects and Impacts

7.0 Introduction

Identifying the significant environmental aspects and impacts of a company's activities, products and services is the most important part of setting up the EMS, as all other elements of the EMS stem from this. Once an aspect has been identified as significant, objectives and targets are established for mitigating its impact, an environmental management programme is established for achieving these objectives and targets, and operational controls are put in place where necessary.

7.1 Background - preliminary effects evaluation

In the summer of 1994 a Preliminary Environmental Review and Effects Evaluation was carried out to identify Software Co.'s position with regard to the environment at that time. This involved identifying the organisation's impacts on the environment throughout the lifecycle of its products, e.g. from pre-production, through production, distribution, utilisation and final disposal. Impacts on the various media, such as air, water, land, resource usage and effects on eco-systems were examined. The main impacts were identified as occurring in the pre-production, production and distribution stages of the product lifecycle. Beneficial or mitigating environmental effects occurred in the utilisation stage. The methodology employed was adapted from the BS 7750 Sector Application Guide for Printing and Packaging (1993). The findings of this evaluation are summarised in Table 7-1.

PRODUCT LIFE		.1	.2	.3	.4	.5
ENVIRONMENTAL RELEVANCE		PRE-PRODUCTION	PRODUCTION	DISTRIBUTION (including Packaging)	USE	DISPOSAL
1	WASTE	2	3	2	☺	0
2	SOIL POLLUTION	2	3	1	0	0
3	WATER CONTAMINATION	2	1	0	0	4
4	AIR	5	5	2	0	4
5	NOISE	2	1	2	0	0
6	ENERGY	2	3	2	0	0
7	CONSUMPTION OF NATURAL RESOURCES	2	2	2	☺	0
8	EFFECT ON ECO SYSTEMS	2	☺	2	0	1

Table 7-I: Environmental effects matrix

Scores were assigned using the scoring system outlined in Table 7-II:

SCORE - NORMAL OPERATING	
0	Impact so low as to be insignificant
1	Has an impact but very minimal
2	Has an impact sufficiently high to be worthy of consideration when selecting alternatives
3	Has an impact where alternatives should be considered or an improvement project is recommended
4	Has an impact where alternatives should be urgently sought
5	Has such an impact that phase out should be planned
EMERGENCY SITUATION - Add	
A	Emergency situation merits advising to senior management urgently
B	Emergency situation requires contact with outside authority
C	Risk of emergency is such that outside authority should be involved in discussion to develop risk reduction
☺	Beneficial environmental effect

Table 7-II: Scoring system for environmental effects evaluation
(Source: *adapted from* BS 7750 Sector Application Guide for Printing and Packaging, 1993)

An Environmental Effects Register was drawn up from this evaluation which identified sources of environmental effects to land, air and water arising from Software Co.'s manufacturing activities (see Figure 7-A).

Figure 7-A: Software Co.'s environmental effects register

7.2 Environmental aspects/impacts evaluation

As part of the postgraduate thesis primary research, this effects evaluation had to be revisited for three reasons:

- The methodology from the original evaluation needed to be revised. Detail (quantitative and qualitative) was lacking as to why each particular score had been assigned.
- The evaluation process needed to be capable of being applied in a consistent manner by different users of the system. The scoring system had to be more clearly defined, so that, where possible, the scoring process was less subjective.
- The evaluation had to be updated to reflect the new terminology of ISO 14001, regarding 'aspects' and 'impacts', instead of 'effects', and progress within the organisation.

The objective of this element of the primary research was to establish a clear methodology for identifying the environmental aspects of Software Co.'s activities, products and services that it could control or influence, in order to determine those which have a significant environmental impact.

7.3 The new methodology for identification of environmental aspects and evaluation of environmental impacts

Environmental aspects were examined and evaluated for Software Co.'s activities, products and services. This evaluation was recorded on the Environmental Aspects Evaluation spreadsheet.

The first step in the identification and evaluation of aspects and impacts was to select an activity, product or service that was large enough for meaningful examination and small enough to be sufficiently understood.

The second step was to identify as many environmental aspects as possible associated with the activity, product or service selected. Where appropriate, the following were considered:

- controlled and uncontrolled emissions to the atmosphere
- controlled and uncontrolled discharges to water
- solid and other wastes
- contamination of land
- use of land, water, fuels and energy, and other natural resources
- noise, odour, dust, vibration and visual impact
- effects on specific parts of the environment, including ecosystems.

Consideration was given to environmental aspects arising, or likely to arise, as consequences of normal operating conditions; abnormal operating conditions, including shut-down and start-up conditions; incidents, accidents and potential emergency situations; and as consequences of past and current activities, or likely to arise from planned activities in the future.

The third step was to identify as many actual and potential, positive and negative environmental impacts associated with each identified aspect as possible.

The fourth step was to evaluate the significance of the impacts. Each impact was examined in the light of the following:

- the severity of the impact
- the likelihood of an event/occurrence of the aspect
- the extent of the impact
- whether legislation exists/is proposed in relation to the issue.

The examination considered:

- the **pollution aspects**, i.e. those which could or do result in putting something into the environment
- **resource usage aspects**, i.e. those which result in something being extracted from the environment.

Both **direct**, i.e. those environmental aspects, which are *directly controllable* by the organisation, and **indirect** aspects, i.e. those which the organisation can *influence*, were considered.

In order to evaluate significance, the author and the QA Supervisor established the scoring system described in Tables 7-III, 7-IV and 7-V to assign scores to each issue:

Score	Severity of Impact
5	Endangers human life/causes irreversible environmental damage, e.g. global warming, ozone layer depletion, use of non-renewable natural resources
4	May cause injury or damage health/long term use may lead to environmental decline, e.g. acid rain, deforestation, effluent discharges to sea, continuous loud noise, incineration
3	Thought to have a negative environmental impact, alternatives should be sought e.g. landfill, use of renewable natural resources such as water, farmed wood
2	Minimal negative impacts, e.g. short term exposure to noise
1	Insignificant impact/beneficial impact, e.g. composting, reuse, energy efficiency

Table 7-III: Scoring the severity of impact

Score	Likelihood of an event / occurrence of the aspect	
5	Inevitable / 100%	Score based on evaluation of past experiences, volumes, and of controls in place.
4	Very probable / high	
3	Occasional / medium	
2	Low	
1	Unlikely / zero	

Table 7-IV: Scoring the likelihood of an event / occurrence of the aspect

Score	Extent of impact
5	Global, e.g. worldwide impact
4	Regional, e.g. affects Ireland/Europe
3	Local community, e.g. affects cities, towns, villages, industrial estate
2	Site, e.g. affects Software Co. site, or similar-sized area
1	part of building, e.g. affects phase 1/2/3, or part of, only

Table 7-V: Scoring the extent of impact

The Risk Priority Number (RPN) is the product of the severity, likelihood and extent rankings, i.e. RPN = severity x likelihood x extent. This value was used to rank order the aspects of concern (e.g. in Pareto fashion). In themselves, RPNs had no other meaning or value. The concept of RPNs was adopted from the Failure Mode and Effects Analysis (FMEA) process used for assessing potential areas of weakness in Software Co.'s processes and failsafing them (analogous to risk assessment).

An aspect was deemed significant if it:

- could be controlled or influenced by Software Co., and
- was directly controlled by legislation, or
- had an RPN ranking of 64 or higher, or
- was of concern to customers, or
- was of concern to insurers, or
- was of concern to the local community.

The process of scoring was carried out by the author and the quality supervisor. The experience of the quality supervisor within the company over the past seven years was crucial to this process. Input was also sought from various personnel as appropriate, particularly Facilities personnel. Information from sources such as monitoring data and audit reports, supplier questionnaires and audits, the parent company - Software Corporation, Engineering Process Change meetings, Environment Team meetings, and the company Suggestion Scheme were utilised by the author throughout the process. Use was also made of reference works, databases, environmental press, the Internet, the media, government and educational institutes.

7.4 Applying the methodology

The evaluation covered over eighty aspects of Software Co.'s activities, products and services. This section describes in detail how the methodology was applied for each aspect and uses an example to illustrate this.

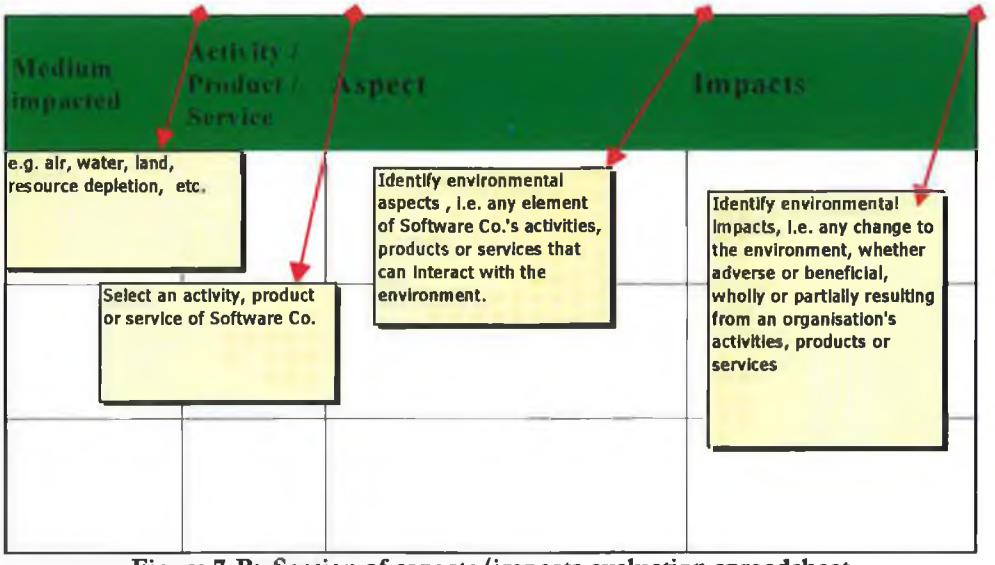

Figure 7-B: Section of aspects/impacts evaluation spreadsheet showing comments on categories

The information was laid out in columns on the spreadsheet, the first four headings of which are shown in figure 7-B. The spreadsheet facilitated the insertion of a comment in each cell, this was indicated by a red dot in the corner of the cell, and the comment was revealed when the cursor was moved over the cell. This allowed for backup information to be inserted 'behind' the sheet.

The procedure for working through an evaluation is demonstrated by following an example given in Table 7-VI.

Medium impacted
Air
Activity/Product/Service
Using halon fire retardants
Aspect
Using halon extinguishers to fight a fire releases halon into the atmosphere
Impact
Halon depletes the ozone layer
Aspect classification
Ozone Depleting Substance
Condition Type
Emergency
Timeframe
Past & Present
Lifecycle stage
Production
Severity of Impact
5
Likelihood of event/occurrence of the aspect
2
Extent of impact
3
RPN
30
Legislative effect
Yes (Montreal Protocol)
Other factors affecting significance
Halon extinguishers have been phased out, the old computer room still has a halon system
Significant
Yes

Table 7-VI: Example of the aspect/impact evaluation process

Explanations as to why each score was assigned were then 'hidden' behind the sheet as comments, these are shown in the yellow boxes in figure 7-C, (which is a continuation of Figure 7-B).

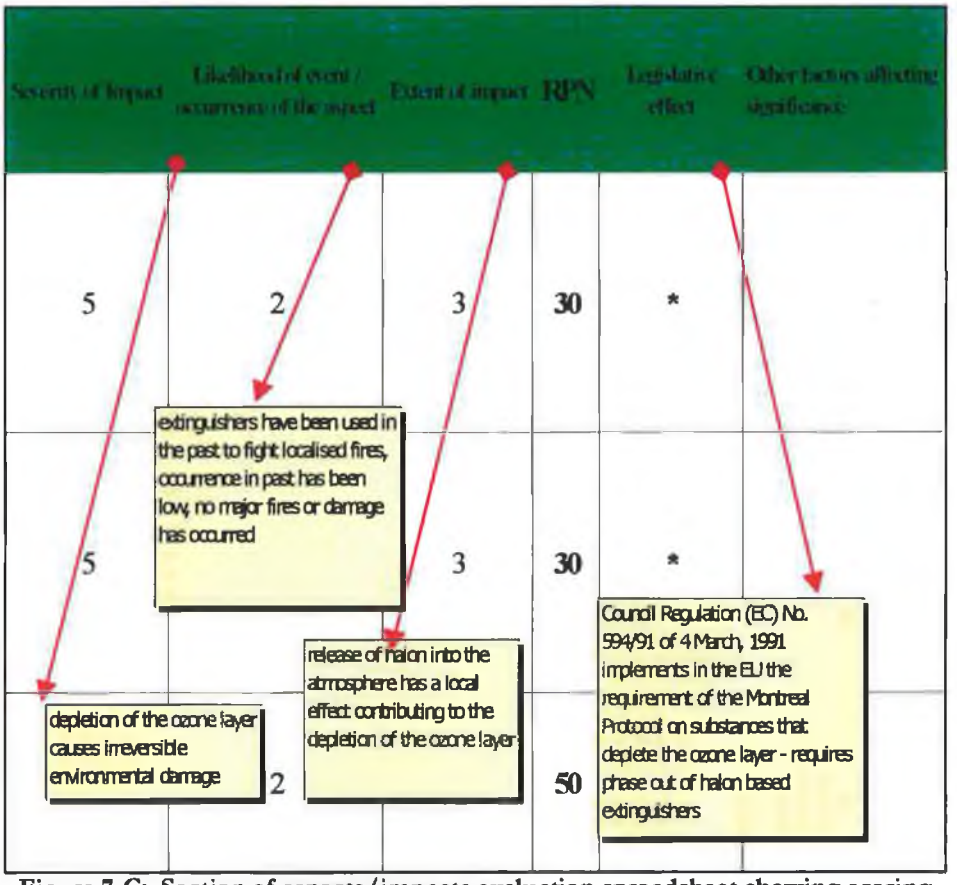

Figure 7-C: Section of aspects/impacts evaluation spreadsheet showing scoring

It can be seen from the example above that assigning the scores was not always a clear cut exercise. For instance, one could argue that the extent of impact from releasing halon into the atmosphere is a global one, as it contributes to ozone layer depletion which is a global effect. However, the volume of halon released in a worst case scenario from Software Co. would be minuscule compared to, for example, releases from the aviation industry. Such anomalies were frequent in scoring during the evaluation process and inevitably a value judgement became paramount, as many of environmental issues are not black and white. The inclusion of additional factors to the scoring to determine significance was necessary. In this instance, although the volume of halon in Software Co. was small, and the likelihood of release from

the premises was low, the fact that there was applicable legislation elevated it to a significant issue.

7.5 Maintaining the register of significant environmental aspects

The process of examining and evaluating the information in the Environmental Aspects Evaluation spreadsheet and deciding whether new information gathered altered that which was on the Register of Environmental Aspects was carried out on an ongoing basis. The spreadsheet was a write-protected (read-only) document. New information could only be entered through the change request mechanism. This enabled a record to be kept of developments over time.

When an environmental aspect had been evaluated as significant to Software Co., it was then authorised by the Environmental Manager and entered onto the Register of Environmental Aspects. Where new information or meeting an environmental objective altered an aspect which was already on the Register, the Environmental Manager approved the revised entry. This was also done through the Change Request mechanism.

The outcome of the evaluation process was the list of significant environmental aspects set out in Figure 7-D.

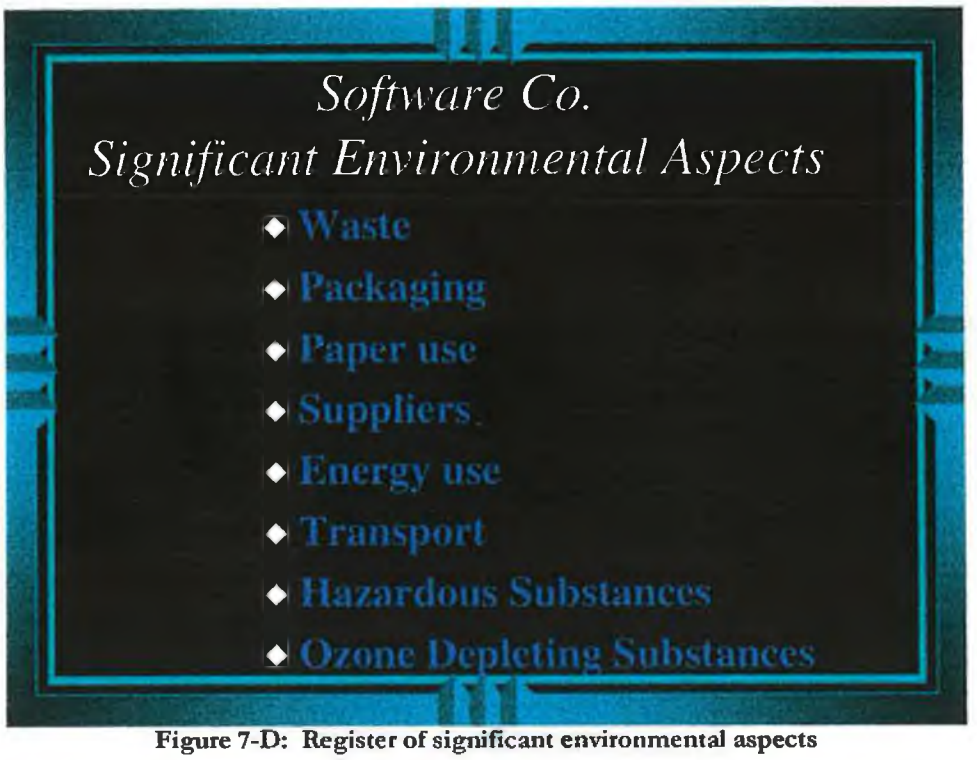

Figure 7-D: Register of significant environmental aspects

7.6 Conclusion

Evaluating the environmental aspects and impacts of an organisation is acknowledged to be the most challenging element of implementing an EMS, and no one method has yet emerged as being the best for doing this. The approach taken by Software Co. utilised a combination of risk assessment and common sense. Much of the evaluation is subjective and significance often cannot be determined on environmental impacts alone, hence the inclusion of other factors to determine significance.

The original Effects Register (ref. Figure 7-A) identified positive and mitigating environmental effects of the software company in addition to negative effects. The aim was to promote beneficial aspects of Software Co. and to emphasis the positive nature of the EMS. Consideration was given to

doing this in the re-evaluation process, and beneficial aspects and impacts were identified in the evaluation. However the scoring system generated only negative aspects as being significant. The final Register mirrored the Adverse Effects in the original Effects Register, with the addition of waste and hazardous substances as significant aspects.

The succeeding cycle of setting objectives and targets and implementing environmental management programmes for continual improvement in each significant aspect is only pertinent for negative aspects, so the decision was made at the time to focus on these negative aspects.

Chapter Eight

Objectives and Targets,

and

Environmental Management Programmes

8.0 Introduction

The next step in the EMS cycle, once the significant aspects had been determined, was to establish and document environmental objectives and targets at each relevant function and level within the organisation. Following this, environmental management programmes were established for achieving the objectives and targets (see Figure 8-A).

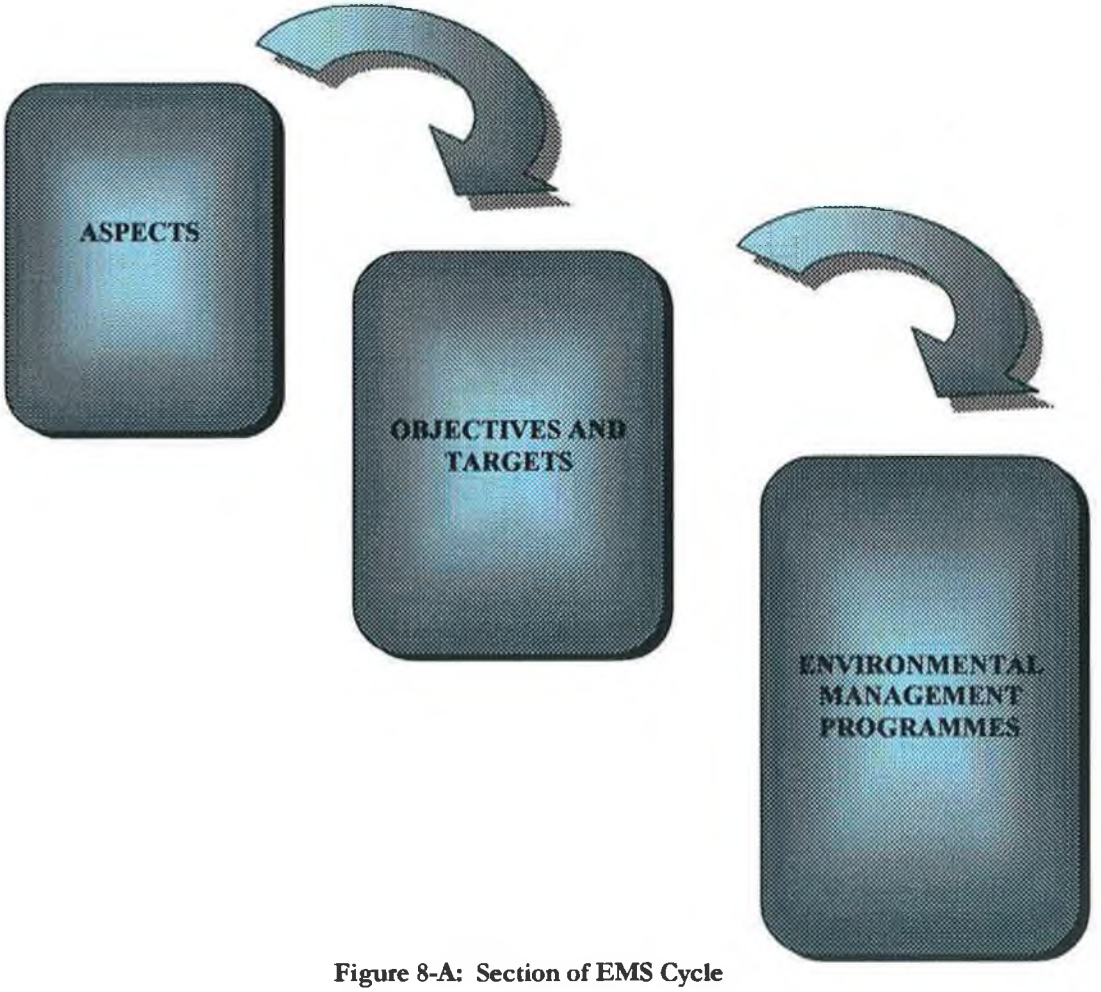

Figure 8-A: Section of EMS Cycle

8.1 Procedure for objectives and targets, and environmental management programmes

The author developed a procedure for setting Objectives and Targets and Environmental Management Programmes as outlined in Table 8-I.

Where an environmental aspect was considered significant to Software Co. and placed on the Register of Environmental Aspects, it was then considered as an area for performance improvement.

Objectives were set in

- areas of major environmental impact
- areas where key issues have arisen from legislation and other developments
- areas where performance measurement could be implemented, was practical and related to the areas in which the company wished and was able to improve its performance.

Objectives were established which were quantifiable if not immediately measurable. Objectives were consistent with the environmental policy and approved by senior management at the management review meeting.

Targets were agreed upon by the Environmental Management Team to show performance improvement in areas where improvement was possible at the time. The aim was for the targets derived from the objectives to be demanding, quantitative and achievable.

The Environmental Management Programmes were established to achieve the stated Objectives and Targets. These programmes designated responsibility for achieving targets at each relevant function and level of the organisation.

A cross-functional team was then set up as the Environmental Management Team, whose aim was to meet monthly and work towards the achievement of the stated objectives and targets by means of the Environmental Management Programmes.

The Environmental Management Team brought together people from the areas of Print Purchasing, Engineering Change Control, Hardware Purchasing, Facilities, and Quality.

The meetings were chaired by the author, who minuted them and communicated progress towards meeting the objectives and targets to interested parties by circulating the minutes by email.

Provision was made for separate programmes to be set up in respect of the environmental management of projects relating to new developments, products, services or processes, or to modified products, services or processes (where the modification introduces significantly different environmental aspects), to define

- the environmental objectives to be attained
- the mechanisms for their achievement
- the procedures for dealing with changes and modifications as projects proceed
- the corrective mechanisms that will be employed should the need arise, how they will be activated and how their adequacy will be measured in any particular situation in which they are applied.

Table 8-I: Procedure for setting targets & objectives, and establishing environmental management programmes

8.2 Environmental management programmes

Separate programmes were developed for each significant aspect. An example of one of these programmes is set out in Table 8-II.

Aspect	
Waste	
Objective	
To reduce the amount of waste going to landfill from Software Co.	
Target	
By 20% in 1997, using 1995 as a base year, when 300 tonnes of waste were landfilled	
Performance indicator	
Tonnes of waste landfilled from January to December inclusive	
Subtargets	**Responsibility & Timescale**
1. Maximise recyclability of cardboard, by ensuring that it is not contaminated with wet waste, etc	Manufacturing By April 1997
2. Introduce paper recycling in office	Facilities By June 1997
3. Recycle photocopier toner and laser printer cartridges	Administration By May 1997
4. Introduce recycling of aluminium cans	Facilities By April 1997
5. Educate workforce to minimise paper use	Quality By July 1997

Table 8-II: Waste environmental management programme

Responsibility for each subtarget was assumed by individuals on the team. New subtargets were developed as previous ones were met.

Table 8-III describes some of the achievements resulting from the Environmental Management Programmes implemented by the Environmental Management Team.

- The target to eliminate halon based fire extinguishers was met in December 1996
- Procedures were drawn up for dealing with oil and chemical spillages. Extra facilities were provided for handling and topping up lead-acid batteries in the warehouse
- A Paper Forum was held with Print Suppliers in February 1997, with Environmental Considerations on the Agenda
- PVC clamshells were originally 100% virgin PVC, then reduced to 60%, using 40% regrind and options are being considered for replacement of PVC with environmentally-friendlier alternatives in new mice and joysticks
- Bubble wrap was replaced with paper filler in October 1996
- The paper content on packaging was constantly being reduced: the paper content on Licensed Disk Packs was reduced by 30% on average in August 1996, and LDPs were eliminated from most CDs
- Ink (print) was removed from master cartons in January 1997 to enable their reuse
- Recycling of paper was introduced into some of the office areas. Separate bins were provided for "wet waste" in order to maximise the recyclability of cardboard (this can only be recycled if dry). Meetings took place with the waste contractors to establish how best Software Co. could manage its waste and maximise its recyclability
- A comprehensive Waste Management Procedure was drawn up by the author in July 1997 describing the new waste handling procedures, including segregation, disposition, and final destination of wastes, including hazardous waste (whether reused, recycled, or landfilled, etc.). The procedure includes details regarding monitoring and reporting waste quantities.

Table 8-III: EMP successes

Progress on the EMPs was reported monthly to members of the team, and other interested parties. Training programmes were developed to create awareness about environmental issues such as waste. Figure 8-B shows a slide

drawn up by the author to create awareness about the destination of wastes arising from an office situation.

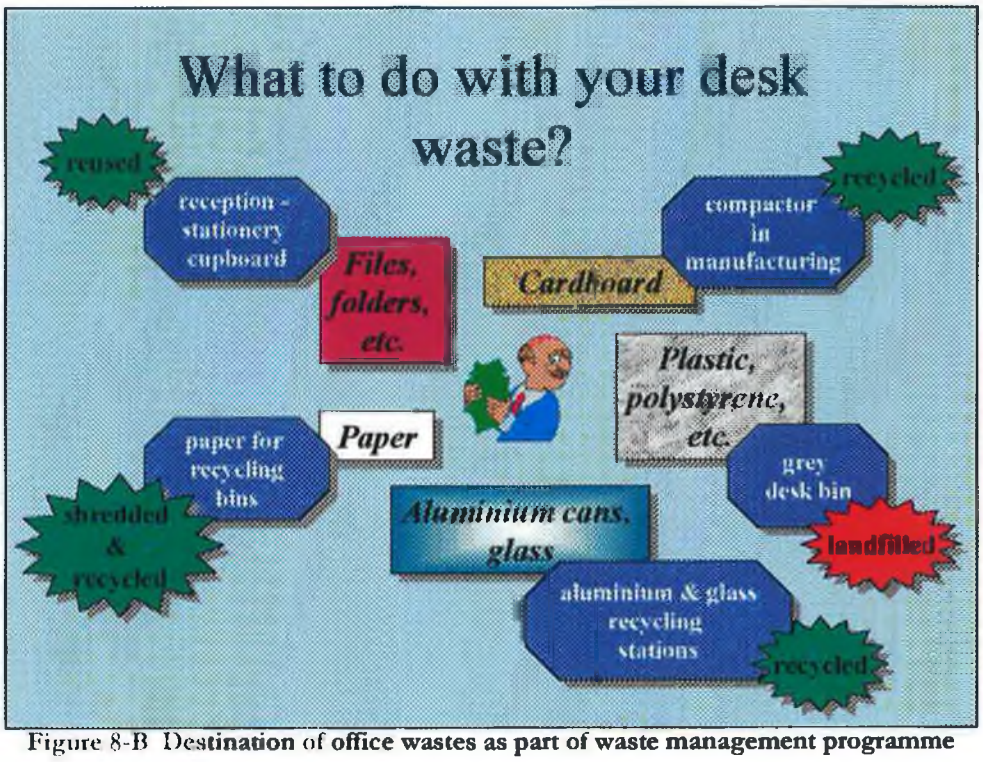

Figure 8-B Destination of office wastes as part of waste management programme

8.3 Conclusion

The environmental management programmes are perhaps the most satisfying part of the EMS. By working towards defined objectives and targets, and meeting these, a record is built up over time of how well the company is doing in moving towards its environmental goals. The EMPs are a mechanism for harnessing the environmental goodwill and enthusiasm of interested employees.

In the initial stages of implementation some difficulties were encountered by the Environmental Management Team, such as:

- other priorities of the team members

- scheduling difficulties
- initially there was a lack of awareness of environmental issues in the company
- only part-time presence of co-ordinator
- lack of senior management support on occasion, especially when reorganisations occurred in the company
- frequent movement of people within the company (both physically, and inter-departmentally).

Many of these difficulties are unavoidable in a large company which thrives on change and reinvention. The implementation approach taken in Software Co. was for a few people in the company to develop the system quietly in the background, getting all the procedures and facilities in place before announcing it company-wide. The positive response received from employees once the training and awareness programme commenced suggests that an inclusive approach from the beginning of the implementation process may have also been successful. However, if adequate resources and immediate follow-through had not been provided at that stage, people may have become disillusioned, and consequentially harder to win across when the EMS finally did come to fruition.

Chapter Nine

Internal Environmental Audits

9.0 Introduction

While progress was monitored on a monthly basis by the Environmental Management Team, another tool for ensuring that targets and objectives were likely to be met was the internal environmental audit. This provided a mechanism for checking and corrective action on the progress of the Environmental Management Programmes. The author drew up an audit schedule based on the importance of the environmental aspects of the organisation. For example, in Software Co. waste was initially scheduled for audit on a more frequent basis than ozone depleting substances.

9.1 Internal audit objectives

The objectives of the internal environmental audit were:

a) to determine whether or not the environmental management system

- conformed to planned arrangements for environmental management, including those outlined in the environmental management manual, programme, procedures and work instructions, and the requirements of International Standard, ISO 14001
- had been properly implemented and maintained

b) to provide information on the results of audits to management.

9.2 Internal audit procedure

The author drew up a procedure for carrying out periodic environmental audits in Software Co. (see Table 9-I).

Audit Notification

Managers are notified in advance by email of the Audit date. If the Area Manager wishes to change the scheduled audit date, he/she will request this change immediately on receipt of the notice giving a reason for the request so that this change can be circulated by email to the Managers on the Circulation List.
Managers may submit requests for additional checks to be made in the course of the audit based on problems they have identified with that area since the previous audit. These requests must be made at least 2 days in advance of the audit.

Carrying out the Audit

Prior to the audit the auditor reviews any Non-Conformance Reports and Corrective Action Requests from the relevant area and notes any outstanding issues.
The auditor prepares a checklist based on the aspect to be audited to determine the effectiveness of the Environmental Management System in controlling this aspect.
Where appropriate, the auditor selects an audit team to assist in carrying out the audit. The auditors should be independent of the functions being audited, have sufficient expertise or training in relevant disciplines and, if necessary, include a technical expert.
The audit checks and records conformance or non-conformance of the selected issue in relation to the following sections of the Environmental Management System:

- Environmental Policy
- Planning, including legal requirements
- Implementation and operation
- Checking and corrective action
- Management review

Audit Review

Where feasible, upon completion of the audit the audit team leader discusses findings with the Area Manager, Operators and Auditors involved in the Audit.
Based on this discussion a list of observations and recommendations may be included by the auditor(s).
Corrective Action Requests are raised where necessary and corrective action target dates sought. These are included in the Audit Report.

Audit Report

The audit team leader prepares an Audit Report detailing:

- conformity or non-conformity of the environment management system element(s)
- effectiveness of the implemented environment management system in meeting objectives and targets
- implementation and effectiveness of any corrective actions recommended in previous audits
- audit observations, conclusions and recommendations
- corrective action requests raised .

The Audit report is e-mailed to the General Manager, the Environment Manager, the auditee(s), and any other person deemed relevant.
Copies of audit reports are maintained on the "Reports" share of the "Software Co.-quality" server.

Table 9-I: Environmental audit procedure

During her time with Software Co. the author carried out audits of the following areas which were prioritised in order of significance to the company:

- Waste
- Energy Use
- Hazardous substances
- Ozone Depleting Substances
- Facilities Instructions
- Security Instructions

9.3 The audit report

The audit report was a useful tool for drawing the attention of top management to the progress of the EMS. The report was circulated by email to the General Manager and to other appropriate managers, as well as to the auditees. A short summary highlighted the main findings (see example in Table 9-II), with further detail to be found in the main report attached to the email. The summary was used as a training tool for the target audience by including details about why a particular aspect was significant to the company.

Ozone Depleting Substances
Ozone Depleting Substances (ODSs) deplete the earth's protective ozone layer. ODSs on-site are halon used for extinguishing fires and small quantities of a refrigerant R22 in the air conditioning system. An objective of eliminating ODSs from Software Co. has been set with a target date of December 1996 for halon and 2005 for R22. This target has been achieved for portable halon-based fire extinguishers, and these have been replaced by water, dry powder and CO_2 -based extinguishers. The halon removed is to be used for essential aviation/military purposes.
Traditionally halon was also used in computer rooms for extinguishing fires. The new computer room was installed using an Inergen fire extinguishing system. This gas does not deplete the ozone layer. The old computer room still has a halon system, this is due for refurbishment this year. The refrigerant R22 which is used in the air conditioning system is in very small quantities, but this gas is due for phase-out by 2005. Our programme for ODSs will monitor progress on seeking alternatives to this gas.
The other area which we need to consider is the use of ODSs by our suppliers and subcontractors in the manufacture of our product/raw materials. An objective and target have been set to identify such ODSs by December 1997.
No CARs were issued for this audit.

Table 9-II: Executive summary of internal environmental audit report

9.4 Integration with quality management systems audits

Initially, it was decided to keep environmental audits separate from quality audits, while leaving the option open to integrate the two at a later date. The environmental audits tended to require a wider range of expertise in areas such as environmental issues and health and safety. Environmental issues are not confined to separate departments, they apply across the company, so an audit may involve contact with a number of different departments. The methodologies learnt through quality auditing nevertheless laid essential groundwork for environmental auditing. Aspects of the environmental

auditing methodology developed could be valuably applied to quality audits in the future. These include:

- Prioritising the frequency of audits in accordance with the importance of issues to the company, rather than merely attempting to cover each procedure/area once during the audit cycle
- Focusing where possible on what is positive more strongly than on finding non-conformances
- Using the audit as a tool for seeking improvements, i.e. rather than simply checking whether there is a procedure, and if that procedure is being followed, the auditor should encourage suggestions as to how the procedure could be improved, or even thrown out and a new process developed.

9.5 Conclusion

The environmental audit primarily looked at how the company was controlling and managing its significant aspects. It monitored progress towards meeting objectives and targets, and checked the level of environmental awareness of the issue. Suggestions and recommendations were made where appropriate. The audit was not a negative, fault-finding exercise as had often been traditionally associated with a QMS audit within the company, but was seen as a positive tool for reporting progress and suggesting how further improvements could be made. Non-conformances were still identified, but as part of a proactive, fail-safing process, with the emphasis always on preventive action.

Auditing by issues was a new way of carrying out systems audits. It provided valuable testing of the entire EMS cycle. However, as the audit cycle progressed, the author found that the documentation to be reviewed for each audit was becoming excessive and repetitive, due to having to print documents relating to each section of the EMS for each audit.

The external auditors recommended returning to the traditional approach of auditing per procedure once an audit cycle had been completed. Auditing by issue was acknowledged to have been a very beneficial process during the learning phase, but once the EMS had been certified and procedures had been put in place for waste management, contractors, etc., then it was felt that auditing by procedure would provide the best use of resources. This also has the benefit of being easier to integrate into the quality audit schedule if it is decided to combine the two disciplines at a later stage.

Chapter Ten

Document Control System

10.0 Introduction

While the environmental auditing system was kept separate from the quality auditing system, other elements of the EMS were integrated with the QMS wherever possible. One such area where full integration was possible and logical was the document control system. This was fully integrated with the existing document control system in Software Co.

10.1 Developing a new procedure

The Document Control system in Software Co. was an electronic one, with all the current procedures available company-wide through the internal computer network. New procedures were developed under standard headings in accordance with the procedure outlined in Table 10-I.

By stating safety, environmental and quality requirements in the one procedure, procedures are fully generic, and this eliminates the necessity for separate quality, environmental and safety procedures.

Objective

State the objective or intention of the document.

Scope

State the process, department group or personnel to which the procedure applies.

References

Give details of other documents that have a bearing on the activities within the procedure.

Definitions

Define the words or terms used in the writing of the procedure that may not be readily understood. The terms may be

- specific to a process, department or group of personnel and may not be readily understood by the other departments or personnel, *or*
- specific to Software Co. and may not be readily understood by vendors, subcontractors, subsidiaries or the parent company.

Equipment

List equipment and materials required in carrying out of the activity.

Procedure

List in logical sequence the actions of personnel involved in the activity.

Identify who does what, what is done and how, when, where, and why the activity is carried out.

State Safety, Environmental and Quality requirements

Documentation

List documentation that is referred to within the procedure and is generated as a result of implementing the procedure. Attach the relevant documentation.

Table 10-I: Document control procedure

10.2 Updating a procedure

The mechanism for updating or changing existing procedures was to raise a change request. This was done electronically. Details were requested regarding the nature of the change and the reason for the change. The change request was then sent automatically for approval (by email) to those on the

approval list. When the change request had been approved, conformation of this was sent via email to the originator. Once approved the document could then be edited by the requestor. When changes were complete, the document then goes to the relevant managers for approval. The document is then formally issued on the system and replaces the previous version, which is archived electronically.

10.3 Conclusion

The primary focus of an EMS is on its effective implementation and on environmental performance, and not on a complex document control system. Utilising an existing QMS system is therefore very straightforward and logical, and comes naturally to quality practitioners. Implementing an EMS, however, brings areas into the system that may have no previous experience in formally documenting their work procedures. For instance, in Software Co. the Facilities Department had a key role to play in the EMS, but had practically no written procedures.

Procedures were 'owned' by the originating departments in Software Co., i.e. each department was responsible for writing and maintaining its own procedures. The Facilities personnel therefore had to be trained in how to write operating procedures and work instructions in accordance with the documentation control procedures, submit them electronically for sign-off, and use the document control system to update them.

The significance of revision numbers and the importance of only using the latest version (available on the network), while second nature to people in

manufacturing, was new to areas such as Facilities, and had to be patiently reinforced.

Having a formal document control system was found to be practically an essential prerequisite to implementing an EMS, as endeavouring to start from scratch would have added an enormous workload to the implementation process.

Chapter Eleven

The Assessment Process

11.0 Introduction

The certification company chosen was registered to UKAS. This company was chosen originally in 1994 when Software Co. was intending to seek certification to BS 7750, as opposed to I.S. 310. The certification process was therefore based on UKAS accreditation criteria at that time, and involved the following steps:

- Pre-assessment visit
- Documentation audit
- Main assessment
- Certification.

11.1 Pre-assessment visit

The environmental certification company carried out a pre-assessment visit to Software Co. in November 1996. One of the outcomes of this visit was the decision to seek accreditation to ISO 14001, and not BS 7750, as originally intended. This was due to the publication of ISO 14001 in September 1996, and the imminent withdrawal of BS 7750 in the following March.

The assessors explained that the pre-assessment visit would focus on two areas:

(a) The identification and evaluation of significant environmental effects, and

(b) the internal environmental audit.

As the identification and evaluation of significant environmental effects was considered to be the cornerstone of the system, the company needed to be

able to demonstrate to the assessors that the task had been tackled in a systematic way, one which the company was able to explain and justify. The internal audit should be capable of confirming that the EMS conformed to planned arrangements and had been properly implemented.

In general, compliance with these areas and ISO 14001 was found by the assessors, but a number of development points were recommended to be addressed prior to the Main Assessment. The main outcome of the pre-assessment visit was the recommendation that the effects evaluation be revisited and that the methodology for the risk assessment employed should be expanded upon. While satisfied that the outcomes of the evaluation, i.e. that the significant environmental effects were appropriate to Software Co., some more work was required on developing the methodology, in particular, on the rationale behind assigning scores. It was suggested that an explanation as to why each score had been allocated be recorded on the spreadsheet.

Following the initial assessment, the author addressed the specific development points made in the report and revised the environmental manual to bring it into line with ISO 14001 requirements. The effects evaluation was totally revised as previously described in chapter 7.

11.2 Documentation audit

In June 1997, the documentation relating to the environmental management system was sent to the certification company for a desk audit. The documentation included the Environmental Manual, operating procedures, instructions and copies of forms. The documentation was reviewed against the requirements of ISO 14001 by the assessors and again a high level of compliance with the standard was found. Again, several comments were made by the assessors, which were addressed prior to the Main Assessment.

11.3 Main assessment

The Main Assessment took place at the end of July 1997. Two auditors carried out the assessment, which took one and a half days on-site. Table 11-I gives a broad itinerary of the Assessment.

Day 1
Opening Meeting - *to introduce the assessment team and to explain how the Assessment would be conducted* **Site tour** **Review** - *of any actions/recommendations arising from the Pre-assessment Visit and the Documentation Audit* ❖ **Aspects Evaluation/Legislation** ❖ **Objectives, Targets and Management Programme** ❖ **Operational Control/Checking & Corrective Action**
Day 2
Brief meeting – *to review any of the corrective actions which had been addressed by the company since Day 1.* ❖ **Audits and Management Review** ❖ **Training, Communications and Contractors** ❖ **Environmental Policy** ❖ ***Other systems elements relating to the Standard such as Organisation, Manual, Document Control, etc. were covered 'in-situ' during the course of the assessment.*** **Assessors Review** – *to write up CARs and observations* **Closing Meeting** – *to give outcome of the assessment, and to issue CARs and give observations and feedback regarding the assessment.*

Table 11-I: Itinerary for the main assessment

11.4 Categories of corrective action

The corrective action process was explained at the opening meeting. There were three categories of corrective action which could be awarded during the course of the assessment:

- Major corrective action
- Minor corrective action, and
- Observations.

The assessors could make as many observations or minor corrective action requests as they wished, and the company could still go forward for

certification. A major corrective action request (CAR), however, would result in certification being deferred until the corrective action had been closed out. A major CAR would normally arise if an entire section of the standard had not been addressed, or if there was evidence that a section had not been implemented. The preliminary processes of the pre-assessment visit and documentation audit lessened the chance of there being a major CAR at the time of the Main Assessment. This was one of the reasons the assessing company retained the three-step approach to certification. Initially the pre-assessment visit had been mandated by UKAS. Since ISO 14001 replaced BS 7750, it is no longer a stated requirement.

11.5 Outcome of assessment

Software Co. was recommended for certification to ISO 14001. Four minor corrective action requests were raised and a number of observations were made. The ISO 14001 certificate and formal report were received during the following month. The first surveillance audit is due to take place three months after receiving the certificate.

11.6 Conclusion

The environmental audit process was very similar to a quality system audit, for ISO 9002 for example, by an external certification body. One key difference in this process was the Pre-assessment visit. This was found to be a very useful exercise, as it concentrated on the effects evaluation. The assessors pointed out areas that needed further work, and this was helpful in ensuring that the company was heading in the right direction. When questioned about the pre-assessment visit, the assessors said that they retained it because clients

generally requested it, and found it to be a beneficial experience, as in Software Co.'s case. They feel that it will probably be phased out in the long term, as people become more familiar with environmental management systems.

The assessment focused on some areas which would not have received such attention in a QMS audit, in particular, the activities of contractors carrying out work on-site. Their role in the event of an emergency, for example, an oil spillage, was scrutinised. Training and communication, particularly processes for dealing with external communications, were also examined in detail. The assessors put particular emphasis on checking for a general understanding of the policy, and awareness of targets and objectives at various levels within the organisation.

Overall, the audit proved to be a valuable learning experience. A change of emphasis is required from traditional QMS audits. Being brought through the examination of the elements of the EMS with the assessors served to highlight areas where this focus was particularly required.

Section III

CONCLUSIONS

Chapter Twelve

Conclusions

Final Conclusions

1. The implementation of ISO 14001 in Software Co. has provided an impetus for environmental improvement. Previously there had been little incentive to plan environmental initiatives as the company was not subject to any environmental licensing requirements.
2. The requirement to identify, interpret and understand the implications of environmental legislation on the organisation was a substantial task. In this case, undertaking some 90 hours of formal study to gain general knowledge of environmental legislation prior to drawing up the Register of Regulations provided a solid grounding for accomplishing this.
3. In determining what aspects were significant to the organisation risk assessment methodologies alone were not sufficient, nor could significance be established purely on a scientific basis.
4. A methodology was developed that was based on established FMEA practices to ensure repeatability, but was qualified by additional stakeholder requirements.
5. Establishing environmental objectives and targets that were demanding, quantifiable and achievable was a complicated task, as information used by accounts often proved to be in a form unsuitable for this purpose. Determining the first year's environmental targets for reduction required a good degree of guesswork.
6. Audits to seek improvements and to establish progress towards targets and objectives gained better acceptance from auditees than audits that sought solely to identify non-conformances.

7. Internal audit reports proved to be an important tool for highlighting environmental issues and reporting progress towards meeting targets to senior management.

8. Conducting internal audits based on significant aspects focused attention on the reason for the system, and so helped people to understand why the system was being implemented.

9. While the company decided it was not advantageous to integrate internal environmental and quality audits in the first instance, it was a logical step to fully integrate the document control system.

10. Having a formal documentation control system already in operation complying with the requirements of ISO 9002 greatly reduced the burden of implementing the EMS.

11. Valuable assistance was received from the system assessors early on in the implementation process, where the determination of significant aspects and impacts was identified as the cornerstone of the EMS – this had not been evident from initial reading of the standard.

12. The continual improvement requirement of ISO 14001 resulted in actual improvement in environmental performance in the company. This was unlike the company's experience in implementing ISO 9002, whereby improvements in product quality were derived from activities outside the requirements of ISO 9002.

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Appendix A

Appendix A

Summary of ISO/TC 207 Programme Status as at December 1996

Standard	Application	Committee/Working Group/Status
ISO 14001 Environmental Management Systems - Specification with Guidance for Use	Specification for an EMS to which organisations can gain third party certification	SC 1/WG 1 Published as BS EN ISO 14001 on 1.9.96
ISO 14002 Environmental Management Systems	Guidelines on special considerations affecting small and medium enterprises	SC 1 Project team Preliminary Stage - Evaluation of market need currently in progress
ISO 14004 Environmental Management Systems - General Guidelines on Principles, Systems and Supporting Techniques	Additional guidance to organisations on design, development and maintenance of an EMS	SC 1/WG 2 Published as BS ISO 14004 on 1.9.96
ISO 14010 Guidelines for Environmental Auditing - General Principles on Environmental Auditing	General principles of environmental auditing	SC 2/WG 1 Published as BS EN ISO 14010 in October 1996
ISO 14011 Guidelines for Environmental Auditing - Audit Procedures - Auditing of Environmental Management Systems	Procedures for planning and conduct of an EMS audit	SC 2/WG 2 Published as BS EN ISO 14011 in October 1996
ISO 14012 Guidelines for Environmental Auditing - Qualification Criteria for Environmental Auditors	Guidance on qualification criteria for environmental auditors, lead auditors, for both internal and external auditors	SC 2/WG 3 Published as BS EN ISO 14012 in October 1996
ISO 14014 Initial Reviews	–	SC 2/WG 1 SC 2 have passed to SC 1 for consideration at 1999 revisions of ISO 14001 and ISO 14004
ISO 14015 Environmental Site Assessments	–	SC 2/WG 4 Preliminary Stage. Scope, definition and market need currently being evaluated
ISO 14020 Environmental Labels & Declarations - General Principles	Principles on the basis of which all environmental claims should be made	SC 3/WG 3 Committee Draft. Due to be published 1998
ISO 14021 Environmental Labels & Declarations - Environmental Labelling - Self Declaration Environmental Claims - Terms & Definitions	Guidance on the use of terms for self-declared environmental claims	SC 3/WG 2 Draft international standard. Due to be published 1998
ISO 14022 Environmental Labels & Declarations - Environmental Claims - Self Declaration Environmental Claims - Symbols	Guidance on self declared environmental claims when using symbols	SC 3/WG 2 Committee draft. Due to be published 1999
ISO 14023 Environmental Labelling - Self Declaration Environmental Claims - Testing & Verification Methodologies	Guidance on testing and verification of self declared environmental claims	SC 3/WG 2 Working Draft. Due for publication in 1999

Appendix A

Standard	Application	Committee/Working Group/Status
ISO 14024 Environmental Labels & Declarations - Environmental Labelling TYPE I - Guiding Principles and Procedures	Guidance for establishing a certification programme for third party environmental claims	SC 3/WG 1 Committee Draft. Due to be published mid-1998
ISO 14025 Environmental Labels & Declarations - Environmental Labelling TYPE III - Guiding Principles and Procedures	Guiding Principles and Procedures Guidance on profiling of product environmental effects	SC 3/WG 1 Work started June 1996
ISO 14031 Environmental Performance Evaluation - Guidelines	Guidance on design and use of environmental performance evaluation	SC 4/WGs 1 & 2 Committee draft. Publication expected mid 1998
ISO 14040 Life Cycle Assessment - Principles and Framework	Principles for carrying out and reporting of LCA studies	SC 5/WG 1 Draft international standard. Publication expected early 1998
ISO 14041 Life Cycle Assessment - Life Cycle Inventory Analysis	Methodology for definition of goal and scope, performance of LCA, interpretation and reporting	SC 5/WGs 2 & 3 Committee Draft. Publication due late 1998
ISO 14042 Life Cycle Assessment - Impact Assessment	General framework and key aspects relevant to different methods of impact assessment	SC 5/WG 4 Working Draft. Due to be published early 1999
ISO 14043 Life Cycle Assessment - Interpretation	–	SC 5/WG 5 Working Draft
ISO 14050 Environmental Management - Terms & Definitions	Contains the terms and definitions used in ISO 14001,4,10,11,12	SC 6/WG 1 Draft International Standard. Due to be published late 1997
ISO Guide 64 Environmental Aspects in Product Standards	Intended for standard writers, this guide sets out the environmental effects that should be considered when developing standards	WG 1 Draft International Guide. Final publication mid 1997

(Source: Hayashi, 1997)

Appendix B

Area	Reference	Legislation, regulation or policy	Description	Area of impact	Direct implications for Software Co.
Air	S.I. No. 6 of 1987	Air Pollution Act, 1987	This act provides a comprehensive statutory framework for the control of air quality	facilities	Emissions are prohibited which may cause a nuisance to any person
Air		Council Regulation (EC) No. 594/91 of 4 March, 1991	This regulation implements in the EC the requirement of the Montreal Protocol on Substances that deplete the Ozone Layer, as amended and adjusted at the 1990 London Meeting of the Parties to the Protocol. It repeals Council Regulation (EC) No. 3322/88	suppliers / facilities	requires the phase out of certain CFCs and halons, e.g. halon based fire extinguishers, R22 refrigerant
Fire	I.S. 291: 1986	The Use, Siting, Inspection and Maintenance of Portable Fire Extinguishers	The Irish standard specification concerns the use and suitability, siting, inspection and maintenance of portable fire extinguishers of the types which conform to IS290:1986 "Portable Fire Extinguishers"	facilities	the Standard covers water, foam and powder extinguishers, both the stored pressure and cartridge types.
Fire	I.S. 3217: 1989	Code of Practice for Emergency Lighting	This Code of Practice concerns the provision of electric emergency lighting in most types of premises. It gives recommendations for the clear indication and safe level of illumination of escape routes in the event of failure of the normal supply.	facilities	gives guidance on the correct application of emergency lighting to the varied requirements of different categories of premises
Fire	I.S. 3218: 1989	Code of Practice for Fire Detection and Alarm Systems for Buildings - System Design, Installation and Servicing	This Code of Practice provides recommendations for the planning, design, installation, commissioning and servicing of fire detection and alarm systems in and around buildings	facilities	gives guidance on the correct application of different types of fire detection and alarm systems and modes of operation which may be employed to the varied requirements of different categories of premises
Fire	PER-35/A4	Hot Work Permits	The cutting-welding and hot work permit is used to prevent fires and /or explosions which arise whenever operations with open-flame or spark-producing equipment are carried out.	security / facilities / contractors	This permit is issued by security or facilities for cutting, welding or hot works carried out by our own staff or outside contractors
Information		Access to Information on the Environment Regulations, 1996	set out the procedures for public access to information relating to the environment held by public authorities in accordance with the provisions of Council Directive No. 90/313/EEC on the Freedom of Access to Information on the Environment	facilities	give the public access to information held by the local authority regarding Software Co.

Area	Reference	Legislation, regulation or policy	Description	Area of impact	Direct implications for Software Co.
Noise	S.I. No.179 of 1994	Environmental Protection Agency Act, 1992 (Noise) Regulations, 1994	These regulations prescribe the form of notice to be served by a local authority or a person who intends to make a complaint to the District Court, concerning a person who is alleged to have made, caused or been responsible for noise	facilities / manufacturing	enables any person to make a complaint to the District Court if noise from Software Co. gives reasonable cause for annoyance
Planning		Local Government (Planning and Development) Acts, 1963 to 1993	Planning laws which are implemented by the local planning authority (local county council), also involvement of appeals board (An Bord Pleanala) and the High Court	facilities	Planning permission must be sought for new developments and change of use of existing developments
Planning	S.I. No. 86 of 1994	Local Government (Planning and Development) Regulations, 1994	These regulations have replaced all existing regulations under the Local Government (Planning and Development) Acts, 1963 to 1993	facilities	Planning permission must be sought for new developments and change of use of existing developments
Planning		Building Control Act, 1990 and regulations made thereunder	This act provides the statutory basis for the making of building regulations and building control regulations.	facilities	need to meet these to obtain planning permission for external works
Policy	MS Corp policy	A Commitment to the Environment - Software Corporation	contains a pledge to conserve, reuse and recycle	Software Co.	embody pledge in Software Co. environmental policy
Safety		Safety, Health and Welfare at Work Act, 1989	lays down general principles of safety, health and welfare applicable to all places of work, outlines duties of employers and employees in ensuring safety, health and welfare at work	personnel	imposes duty on employers of compiling a Safety Statement based on an identification of hazards and assessment of risks
Safety	S.I. No. 44 of 1993	Safety, Health and Welfare at Work (General Application) Regulations, 1993	contain detailed legal requirements on nine major topics concerning safety, health and welfare at work, i.e. general provisions, workplaces, work equipment, personal protective equipment, handling of loads, VDUs, electricity, first aid, notification of ac	personnel	amplifies the general principles contained in the 1989 Act
Safety	S.I. No. 10 of 1955	Factories Act, 1955	contains provisions for safety, health and welfare in factories	personnel	section 42 - identification, construction and maintenance of air receivers
Waste	S.I. No. 33 of 1982	European Communities (Toxic and Dangerous Waste) Regulations, 1982 as amended	Implements EC Directive 78/319/EEC. Require that any person storing, treating or depositing such waste must have a permit from their local authority.	waste contractors	need to ensure that contractors taking away our hazardous wastes have appropriate permits from local authorities

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Waste	S.I. No. 399 of 1992	European Communities (Waste Oils) Regulations, 1992	These regulations give effect to Council Directive No. 87/101/EEC of 22 December, 1986 amending Council Directive No. 75/439/EEC of 16 June, 1975 on the disposal of waste oils. They revoke the European Communities (Waste Oils) Regulations, 1984	waste contractor	a person producing, collecting, holding or disposing of waste oils shall take measures to prevent their discharge to waters, drainage systems or their deposit or discharge to soil.
Waste	S.I. No. 12 of 1997	Litter Pollution Act, 1997	basic duty of occupiers of property to keep their premises free of litter	facilities / manufacturing	imposes duty of keeping property free of litter
Waste	94/62/EC	EU Directive on Packaging and Packaging Waste	will require a minimum 25% recovery rate five years after commencement. A five year "Recycling for Ireland" strategy provides for a target recycling rate of 33% for packaging waste to be achieved by 1999.	product support / suppliers	incentive to reduce packaging, to increase recyclability of our products, and recycle more of our packaging waste
Waste	S.I. No. 10 of 1996	Waste Management Act, 1996	a comprehensive and modern legislative framework for waste management in Ireland. It replaces older statutory provisions which were based principally on the Public Health Acts and on various regulations under the European Communities Act, 1972	suppliers / manufacturing	incentive to reduce amount of waste going to landfill
Waste		Draft Waste Management (Packaging) Regulations, 1997	will impose obligations on 'producers' of packaging, especially 'major producers'. Major producers (who annually place more than 25 tonnes of packaging on the Irish market and have an annual turnover in excess of £1million) must either join Repack or tak	manufacturing	to join Repack
Waste	German legislation	Closed Cycle Industry Act - due to come into effect in Germany on 6th October 1996	stipulates that manufacturers are bound to take back used or unwanted products.	returns/ product support	Manufacturers will be bound to take back, and recycle as far as possible, used or unwanted products at their own expense, providing them with an incentive to reduce waste at source.

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Waste	German legislation	Green Dot (Der Grune Punkt)	Industry has set up the Duales System Deutschland (DSD) which licences the Green Dot symbol - also valid in France (Eco-Emballages) and Belgium (Fost Plus)	product support	Software Co. pays a charge per kg to DSD on packaging exported to Germany
Waste	S.I. No. 390 of 1979	European Communications (Waste) Regulations, 1979	The regulations provide for permits to treat, store and tip waste.	waste contractors	Our waste contractors must have a permit to treat, store and tip waste from their local authorities.
Waste	German Draft Regulation	IT equipment regulation	In order to promote the recycling industry, this regulation stipulates the responsibility of manufacturers and distributors to take back, to recycle and to dispose of used IT equipment	returns/ product support	includes equipment such as keyboards, mice and other IT accessories
Water	S.I. No. 14 of 1959, S.I. No.31 of 1962, S.I. No. 1 of 1980	Fisheries (Consolidation) Act, 1959 as amended by Fisheries (Amendment) Act, 1962 and by the Fisheries Act, 1980	Sections 171 and 172 of the 1959 Act make it an offence to deposit deleterious matter, as defined, in waters.	suppliers / facilities / contractors	could be prosecuted for allowing "deleterious matter" into "waters", as defined by the Act
Water	S.I. No. 1 of 1977, S.I. No. 21 of 1990	Local Government (Water Pollution) Act, 1977 & Local Government (Water Pollution) (Amendment) Act, 1990	These acts include a general prohibition on causing water pollution, provisions concerning licensing of discharges to waters and to sewers, water quality standards, water quality management plans, civil liability of polluters.	suppliers / facilities / contractors	offence to cause or permit any "polluting matter" to enter "waters", as defined by the Act
Air / Water / Land	S.I. No. 7 of 1992	Environmental Protection Agency Act, 1992	Introduces a system of Integrated Pollution Control (IPC) for the more polluting industrial processes	suppliers	if scheduled in the First Schedule to the Act, certain suppliers (e.g. printers) may need an IPC licence from the EPA which covers all polluting releases